



**Abstract Book of the
Multi-Conference on
Systems, Signals & Devices**

SSD 2016

March 21–24, 2016

Leipzig, Germany



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13th International Multi-Conference on Systems, Signals and Devices (SSD'16)

**March 21–24, 2016, Leipzig,
Germany**

Organized by:

Leipzig University of Applied Sciences, (Germany)

Technische Universität Chemnitz, (Germany)

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Preface

Following the success of SSD'01 held in Hammamet-Tunisia, the thirteenth International Multi-Conference on Systems, Signals and Devices - SSD'16 to be held at Leipzig, Germany, from 21st to the 24th of March 2016. The conference program consists of 3 plenary sessions, 6 Keynote Lectures and 24 oral sessions. SSD'16 multi-conference is organized to include 5 conferences covering different fundamental and applied aspects:

- 1 SAC: "Int. Conf. on Systems, Automation & Control"
- 2 PSE: "Int. Conf. on Conference on Power Systems & Smart Energies"
- 3 CSP: "Int. Conf. on Communication, Signal Processing & Information Technology"
- 4 SCI: "Int. Conf. on Sensors, Circuits and Instrumentation Systems"
- 5 MiNE: "Int. Conf. on Micro & Nano Electronic Systems"

SSD'16 secretariat has received 178 submissions from 19 countries: Algeria, Belgium, France, Germany, India, Iran, Italy, Jordan, Korea, Lebanon, Morocco, Oman, P.R. China, Qatar, Saudi Arabia, Spain, Tunisia, United Kingdom and USA.

Each paper has been reviewed by at least two reviewers of the program committee which consisted of more than 100 scientists from more than 30 countries. Only 135 papers have been accepted.

We would like to express our deep gratitude to all chairs and members of the program committee for their substantial reviews. Special thanks are due to all members of the organizing committees for their determination to make this event a promising success.

Finally, we would like to extend our deep gratitude to all those who have contributed to the financial support of SSD'16.

Professors Faouzi Derbel and Moez Feki

Leipzig, Germany

March, 2016

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Conference on Systems, Automation & Control

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Topics:

r Advances in linear control theory	Optimal and stochastic control
System optimization	Variable Structure Control
Multivariable control	Robust control
Large scale systems	Hierarchical and man-machine systems
Infinite dimension systems	Intelligent control systems
Nonlinear control	Robotics and mechatronics
Distributed control	System identification
Predictive control	Biological and economical models & control
Geometric control	Neural networks and neural control
Adaptive control	Fuzzy systems and fuzzy control

Conference on Power Systems & Smart Energies

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Topics:

Electric machines modeling and control	Monitoring and diagnostics
Electric machine design	Power systems
Special machines	Renewable energy generation
Power electronic converters	Electromagnetic compatibility
Variable speed drives	Variable speed generating systems
Automotive electrical systems	Transformers

Conference on Communication, Signal Processing & Information Technology

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Topics:

Signal processing	Telecommunication systems
Communication systems	Coding compression
Digital signal processing	Information theory
Image and video compression algorithms	Communication networks
Speech recognition	Wireless communication
Person authentication	Optical communication
Biometry and medical imaging	Wireless sensor networks
Data fusion	MIMO communications
Pattern recognition	Artificial intelligence
Modulation and signal design	Information retrieval
Communication theory and techniques	Adaptive antennas
Communication protocols and standards	Smart antennas

Conference on Sensors, Circuits & Instrumentation Systems

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Topics:

Fundamentals and physics	Analog & digital signal processing
Self test	Neural networks implementation
Fault tolerance system & diagnosis	Pulse mode neural networks
Simulation and design	Genetic algorithm implementation
Calibration and quality insurance	Sigma delta converters
Sensors and actuators	Design for testability
Transducer design	Low-voltage design
Optical sensors and applications	Low-power VLSI design
Biomedical instrumentation systems	RF circuit design
Circuits and systems	Smart home
Full custom and semi-custom integrated circuits:	Life sciences
– Design concepts	Environmental applications
– architectures and high-performances	Opto-electronics
– low-power circuits	Micro-machines

Conference on Micro & Nano Electronic Systems

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Topics:

SOC, NOC, SIP design	Low Voltage and Low Power systems
Embedded systems	Simulation, Validation and Verification
Wireless systems	Analog and Mixed Signal testing
MEMS and MOEMS systems	Nanostructured / nanoporous Materials and devices
Device modeling	Carbon Nanostructures and devices
Material characterization	Polymer Nanotechnology
Failure analysis	Soft Nanotechnology and Colloids
New components	Synthesis of Nanomaterials
Reliability issues	Sustainable Nanomanufacturing
Memory testing	Nanoscale Materials Characterization
3D Technology	Nanocircuits and Nanoarchitectures
Defect and fault modeling	Sensors based on emerging devices
MEMS/MOEMS testing	Modeling and Simulation at the Nanoscale
SOC and SIP testing	Renewable Energy Technologies
Fault Simulation, ATPG	Bionanomaterials and Tissues Engineering
DFT, BIST and BISR	Biosensors, Diagnostics and Imaging
ATE issues	Nanosensors and Actuators
Nanofluids	Nanorobotics and Nanomanipulation
Smart Grid	Measurement of health risk
DNA nanotechnology	Aerospace and Vehicle Manufacturers

SSD'16 : Multi-Conference Program

	09 h 00 – 10 h 00	10 h 00 – 10 h 30	10 h 30 – 11 h 15	11 h 15 – 12 h 00	12 h 00 – 14 h 00	14 h 00 – 14 h 30	14 h 30 – 15 h 30	15 h 30 – 16 h 00	16 h 00 – 18 h 00	18h 00 – 19 h 00	19 h 30
Monday March, 21				Registration		Official Opening	Plenary Session 1	Coffee Break	Oral Sessions SAC 1 & PSE 1 CSP1 & SCI 1	SSD Meeting	Free Activities
Tuesday March, 22	Plenary Session 2	Coffee Break	Keynote Lectures L1	Keynote Lectures L2	Lunch	Oral Sessions SAC 2 & PSE 2 CSP 2 & SCI 2		Coffee Break	Oral Sessions SAC 3 & MiNE 1 CSP 3 & SCI 3	Free Activities	
Wednesday March, 23	Plenary Session 3	Coffee Break	Oral Session SAC 4 & PSE 3 CSP 4 & SCI 4		Lunch	Oral Sessions SAC 5 & MiNE 2 CSP 5 & SCI 5		Coffee Break	Oral Sessions SAC 6 & PSE 4 CSP 6 & MiNE 3	Closure	Conference Dinner at 19h30
Thursday March, 24	Post Conference Program										

Plenaries and Keynote Lectures

Reference: (PL-1)

Title: Why Communication Networks are the Next Big Thing!

Author(s): Frank Fitzek (Germany)

Abstract – The talk will be about the role of the communication networks for upcoming 5G systems. It will highlight the disruptiveness from existing networks and show new market potentials. New technologies for the networks are also discussed and put into perspective to the requirements of the Tactile Internet. Also the political role of communication networks is discussed.

Reference: (PL-2)

Title: The Role of English in the Production and Dissemination of Knowledge: Hegemony or Homogeny?

Author(s): Mohammed Amin Awwad (Jordan)

Abstract – This paper's thesis is that English will continue to rank first in the world language hierarchy as well in the European Union Language hierarchy as regards the production and dissemination of knowledge. Together with French and German it will play an important role in the internationalization and homogenization of higher education across time and space, and will, therefore, significantly and positively contribute to a more democratic and equitable world. The paper will also show that language, national identity, social, economic, scientific and political discourse and culture are inseparable and nation-specific traits even though this is mitigated by the homogenization processes and character of a universe with a shared international identity. It will provide evidence that inadequate language competence in English, French, and Arabic is responsible for the modest academic achievement in Jordan, Morocco, Tunisia, and the United Arab Emirates university graduates. As universities and other institution of higher education play a major role in the production and dissemination of knowledge, promote internationalization of education, support mobility of students and faculty members, they are best qualified to chart future trends and processes that will lead to the homogenization of Higher Education while still focusing on national, cultural and academic heritage. The paper will argue that the homogenization and the production and distribution of knowledge requires much more than English language competence courses in the basic skills, and in English for academic purposes. Joint on-line open courses, a joint Middle East- European Union area of higher education, and translation programmes can certainly help. However much more important steps and strategies would be needed: establishing joint-degree programmes, and large scale student and faculty mobility programmes, which proved to be most successful in India and China becoming important contributors to the advancement of science and technology. The paper will also provide evidence that translation cannot and does not produce material which correctly represents the thought processes and the full meaning intended in the original English text. Sometimes, the English (and other mother tongue) texts themselves are subject to an internal process of translation, mediation, and negotiation by their native speakers. Furthermore, the paper will show that complete congruence between any two language struc-

tures is untenable, which makes mobility of students and academic staff the best strategy for the production and dissemination of knowledge.

Reference: (PL-3)

Title: Impedance spectroscopy for measurement and sensor solutions

Author(s): Olfa Kanoun (Germany)

Abstract – Impedance Spectroscopy is an interesting measurement method in many fields of science and technology including medicine, chemistry and material science. The possibility to use information from complex impedance over a wide frequency range leads to interesting opportunities for separating effects, accurate measurements and measurements of non-accessible quantities. Especially in the field of sensors a multi-functional measurement can be realized. But for this measurement method, several aspects should be specifically addressed such as, impedance measurement procedures, investigations of physical and chemical phenomena taking place, development of suitable impedance models and extraction of target information by optimization techniques. Especially low cost realization in embedded systems leads to highly interesting scientific challenges and provides interesting improvements of quality of measurement.

Reference: (KL-SAC-PSE-1)

Title: Cooperative control of networked robotic systems

Author(s): Filippo Arrichiello (Italy)

Abstract – Networked robots, i.e. robotic devices connected to a communications network, have been object of widespread research in the latest years due to their broad application domain, flexibility, potential robustness to faults and capacity to accomplish complex tasks alternatively impossible for single units. Despite their clear advantages, networked robots pose challenging problems due to the interaction among control, communication and perception. This talk is about cooperative control strategies for networked multi-robot systems to achieve specific missions as connectivity maintenance and formation control with robustness to failures, with a focus on experimental validation with mobile robots. The talk will end with a focus on networked robots issues when operating in the marine environment, illustrating the main challenges that will be addressed in the ongoing H2020 research project WiMUST.

Reference: (KL-SAC-PSE-2)

Title: Analysis and control of chaotic behavior in an electromechanical drive

Author(s): Moez Feki (Tunisia)

Abstract – The hybrid two-phased stepper motor is a common electromechanical converter widely used in robotic field and small devices positioning systems such as disk drives ...etc. Originally, stepper motors were designed to provide precise discrete positioning in an open-loop control mode. However, it has been shown that using the stepper motor in an open loop configuration gives poor performance if it is driven using higher stepping rates than advised by the constructor. Indeed, we have shown that quasi-periodic as well as chaotic behaviors appear as the power supply frequency is increased

and this is due to incompatibility between the motor inertia and the driving speed. Therefore, controlling the chaotic behavior of the stepper motor becomes a worthwhile endeavor. We present in our keynote several strategies to stabilize the periodic behavior of the stepper motor with frequency input feedback loop, hence we extend the operating domain of the stepper motor to frequencies larger than advised by the constructor.

Reference: (KL-SCI-MiNE-1)

Title: Unobtrusive Smart Sensing and Pervasive Computing for Healthcare: Cardiorespiratory and Physical Rehabilitation Assessment

Author(s): Octavian Postolache (Portugal)

Abstract – The ageing phenomena requires the development in the near future of the new systems and services that will provide increasing of healthcare quality, with increased acceptance by the users reducing also the costs. In this context the distinguished lecture will presents a set of vital signals and daily activity monitoring unobtrusive solutions as so as the appropriate signal processing associated with the measurement channels. Will be highlighted:

- Vital signals acquisition and processing by embedded devices in clothes and/or accessories (e.g. smart wrist worn) or in walking aids and transportation equipment such as walker or manual wheelchair. The strength and drawbacks regarding cardiac and respiratory assessment capabilities, the studies on cardiac sensing accuracy estimation and artefacts influence on cardiac function sensing through capacitive coupled electrocardiography, electromechanical film sensor and microwave Doppler radar ballistocardiography, reflective photoplethismography will be discussed.
- Motor activity sensing through microwave motion sensor, MEMS inertial measurement as so as the appropriate signal processing will be discussed. Several methods for diagnosis and therapy monitoring, as time frequency analysis, principal component analysis and pattern recognition of motion signals with application to gait rehabilitation evaluation will described. Some developed works under the project Electronic Health Record for Physiotherapy promoted by Fundação para Ciência e Tecnologia, Portugal, related to Kinect natural interaction serious games for physiotherapy will be also presented.

Reference: (KL-CSP-1)

Title: The novel use of Darwin's 'Survival of the fittest' concept in sensory feature selection for the design of condition monitoring systems

Author(s): Amin Al-Habaibeh (United Kingdom)

Abstract – The concept of 'Survival of the fittest' is originated from Charles Darwin's book of 1859 "On the Origin of Species by Means of Natural Selection", in which his evolutionary theory was outlined describing the mechanism of natural selection. The survival of the fittest concept has been implemented in the engineering sector in condition monitoring systems by Professor Amin Al-Habaibeh and his team during the past 20 years for feature extraction for evolutionary selection of the most suitable sensors and signal/image processing

systems for enhanced system's performance. The term 'ASPS' which stands for Automated Sensor and Signal Processing Selection was used over the past years to articulate the concept which is related to the selection of the most suitable sensory characteristic features for the design of an improved condition monitoring system. A condition monitoring system of a machine, system or a process involves the selection of the most suitable sensor and signal/image processing method to extract the information related to the health conditions (or any other monitored characteristics) and the least dependent on noise and other operational conditions. Neural networks have been used to independently evaluate the performance of the theory and the suggested methodology. The theory has been tested in several projects and a wide range of applications including end milling, turning, drilling, fixturing systems, crowd monitoring and condition-based maintenance of gears. Ongoing work also includes water leakage detection in pipes and medical applications.

Reference: (KL-CSP-SCI-MiNE-2)

Title: Quantum Communication Simulator (QuCS) as an effective software for Quantum Experiment and Communication

Author(s): Zuriati Ahmad Zukarnain (Malaysia)

Abstract – Quantum communication promises for unconditional security with faster transmission. Current digital communication mechanism suffers serious drawbacks due to its inherent weakness. Unlike, digital communication, quantum communication based on complex quantum mechanism principles. Further, quantum based experiments are expensive and sophisticated due to its optical components and sensitive mode. Simulation plays a vital role in all fields of science and engineer. In order to achieve an effective simulation for quantum communication experiments required not only computer science but also mathematics, physics and engineering aspects. Currently, we developed a prototype simulator called quantum communication simulator(QuCS). Quantum experiments basically cover both continuous and discrete events. Further, few devices have its own dynamics action, i.e. avalanche photo detector (APD). Hence, a combination of discrete, continuous and system dynamic simulation techniques are involved to develop a quantum communication simulator. We called this method as hybrid simulation technique. Further, we classified the process of quantum experiments. The devices or components emulation comes under macro simulation. The action or changes in devices is defined as meso simulation. Finally, design of atomic level such as photon, electron called as micro simulation. The photon or electron is basically refers as quantum bit (qubit). Modeling a qubit is challenging task. Typically, qubits has various properties and careful attention is required in selecting and mapping with macro and meso simulations. Moreover, quantum itself is a stochastic nature. Hence in QuCS, well-defined random functions are implemented. We have developed simulation for a polarized based quantum secret key communication. In this scenario, sender transmits polarized encoded photons as qubits and receiver randomly choose the polarization. This scenario is called as quantum key distribution (QKD). In this experiment, we simulated the fiber optics as channel, photon source, passive photonic components as transmitter and detector, passive photonic components as receiver. The distance and noise factors are the performance metrics. In overall, QuCS simulates the life cycle

of qubit during the experiment. The proposed simulation designed as GUI based drag and drop solution with various internet features. Just a simple drag and drop method to develop a quantum experiments. This simulator abstract and encapsulate the quantum mechanics principle. This tool can serve for both teaching as well research. However, simulator lacks of various experiments components in order to build the higher lever experiments. Hence, our future goals are to enhance both quality of results and quantity of components.

Papers

Paper Reference: (SAC-1-1) 1570219159

Title: Path Tracking Control of a Mobile Robot using Fuzzy Logic

Author(s): Mohammed Hashim and Mohammed Mehdi Ali (Jordan)

Abstract – Recently, the study and development of the mobile robot is considered as a very important issue for many researchers. This is because the wide range of mobile robot applications in real life. One of the most important mobile robot tasks is the control of its navigation in tracking its predefined path. This also need a good capability in avoiding any static or dynamic obstacles that the mobile robot face in its route until reaching its destination. The difficulty in finding a good mathematical model for the mobile robot used in this research “Robotino® from Festo company” made the decision to use fuzzy logic to design a controller capable to introduce a safe Robotino® navigation. Fuzzy logic controller needs information about Robotino® features and behavior in order to build its rule base which are inspired from human experience in such application. These rules can be easily programmed to bring out an efficient controller. Sugeno algorithm is implemented which the experiments results validated its efficiency. Fuzzy logic controller with 153-fuzzy rule is used for controlling the Robotino® path tracking issue, while another fuzzy logic controller with 27-fuzzy rule is applied for the Robotino® obstacle avoidance feature. Matlab is used as a tool to implement the two proposed fuzzy controllers. Many real-time experiments have been conducted in the Faculty of Engineering research laboratory at Philadelphia University. Results reflect the good abilities of the proposed controllers.

Paper Reference: (SAC-1-2) 1570232962

Title: Design and Implementation of a RoBO-2L MATLAB Toolbox For a Motion Control Of a Robotic Manipulator

Author(s): Hani L. Elshatarat, Mohammed Bani Younis and Rolf Biesenbach (Jordan–Germany)

Abstract – Modern industrial automation has become nowadays inextricably linked with the mechatronic system of the industrial robot. These robots are programmed using a cumbersome well-chosen program commands prescribed in a complicated programming language. This paper describes the implementation of a Robot Offline Programming Toolbox (RoBO-2L) functions and communication tools. This toolbox is interfaced, and tested for the motion control of KUKA KR6-R900-SLXX as a Master project in Hochschule Bochum, Germany. This KUKA manipulator has a new controller version that uses KUKA.RobotSensorInterface package to connect the KUKA controller with a remote PC via UDP/IP Ethernet connection. This toolbox includes many functions for initialization, networking, forward kinematics, inverse kinematics and homogeneous transformation. SysML is for the design and implementation of the MATLAB Toolbox which eases the effort of the programming and integration of the interdisciplinary functions and methods.

Paper Reference: (SAC-1-3) 1570232997

Title: Obstacles Avoidance for Omnidirectional Mobile Robot Using Line Tra-

jectory Adaptation

Author(s): Mohammed Mehdi Ali and Tariq Younis Ali (Jordan)

Abstract – This paper presents an algorithm which is designed based on the adaptation of Straight-Line Equation parameters in order to detect and avoid both static and dynamic obstacles. A real-time measurement is collected making use of the already built-in nine infrared sensors along with the added ultrasonic sensor to increase the obstacle recognition range. The related control actions coming from the executing of the control algorithm are used to force the mobile robot movement through its three drive units to reach destination safely. This has been achieved by updating the required distance and orientation angle. The experimental results showed the effectiveness of the proposed algorithm in the sense of avoiding obstacles without collision and reaching the goal with minimum position error.

Paper Reference: (SAC-1-4) 1570235197

Title: Holonomic Modeling and Hierarchic Tracking Control of an Unstable Underactuated Nonholonomic System

Author(s): Carsten Knoll, Klaus Röbenack and Bolorkhuu Dariimaa (Germany)

Abstract – We consider a two-wheeled single axle vehicle freely moving on the horizontal plane. This system is underactuated, nonholonomic and unstable. In order to achieve a simple control structure, the system is modeled on two levels: a nonholonomic kinematic model covering the motion of the axles midpoint and a holonomic kinetic model reflecting the (unstable) dynamics of the 3D multibody system. The kinematic model can be controlled via dynamic extension and exact feedback linearization while the multibody system is stabilized by a linear static state feedback. Both models are linked by the velocities of the wheels. The unavoidable lack of controllability for vanishing velocity is also addressed.

Paper Reference: (SAC-1-5) 1570235914

Title: Synthesis of unity magnitude shaper: extension for explicit fractional derivative systems

Author(s): Ahmed Abid, Rim Jallouli-Khlif, Pierre Melchior and Nabil Derbel (Tunisia–France)

Abstract – This paper presents an approach to determine the time locations of a three-impulses sequence input shaper known as Unity Magnitude shaper (UM). The analytic design of UM shaper is already achieved for undamped systems and for low-damped ones. In this work, the analytic design for damped systems of such shaper is first developed for second order systems, then, extended to explicit fractional derivative systems. Graphical approaches are used to counter analytical difficulties.

Paper Reference: (SAC-1-6) 1570244585

Title: Exoskeleton robots for upper-limb rehabilitation

Author(s): Yassine Bouteraa (Tunisia)

Abstract – This paper presents a new design of a robot elbow rehabilitation: Wireless Remote Control Arm exoskeleton (WRCAE). The robot is designed for the upper limb therapy. The developed system is an exoskeleton with two degrees of freedom that can be used for the treatment, evaluation and reinforcement. The exoskeleton actuates the both movements: flexion/extension for the elbow and pronation/supination for the forearm. Angles limits(max and min) should be introduced by the physiotherapist through a Human-Machine Interface (HMI). Desired angles of the both movements (elbow flexion/extension or forearm pronation/supination) are sent remotely via the ZigBee protocol (xbee-pro communication). A kinematic model has been developed based on Denavit-Hartenberg approach to make first tests. A sliding mode robust law control has been implemented. A kinect camera was built to detect different measures of flexion/extension and send feedback to the controller. The Lyapunov-based approach has been used to establish the system asymptotic stability. Experimental results are provided to demonstrate performances of the developed robot of upper limb remote rehabilitation.

Paper Reference: (SAC-1-7) 1570254776

Title: Real time synthesis of UM shaper: Extension on explicit fractional derivative systems

Author(s): Ahmed Abid, Rim Jallouli-Khlif, Pierre Melchior and Nabil Derbel (Tunisia-France)

Abstract – Input shaping command is applied in order to reduce the system vibration. Desired systems inputs are elaborated so that the system finishes the requested evolution without residual vibration and with optimal response time. This approach was developed by N.C. Singer and W.P. Seering first by involving only positive impulses such as ZV (zero vibration) and ZVD (zero vibration derivative) shapers, then by using positive and negative ones like Negative ZV shaper and UM (unity magnitude) shaper. The last technique was extended to fit explicit fractional derivative systems. In this paper, UM shaper parameters are calculated in real time, first on second order systems, then on explicit fractional derivative ones. Simulation results are given.

Paper Reference: (SAC-2-1) 1570233180

Title: FDI and FTC technique based on Thau observer and Flatness theory for a quadrotor

Author(s): Nizar Chelly and Anis Bacha (Tunisia)

Abstract – This paper presents a technique of FDI and FTC based on Thau observers and flatness theory. The Thau observer allows to estimates the outputs of the system (sensor outputs) to develop the fault detection and isolation. The flatness allows to develop a fault tolerant control by generating a non-faulty analytically redundant measures. This technique is simulated to a non linear system which is the quadrotor in the case of gyroscope faults.

Paper Reference: (SAC-2-2) 1570233395

Title: Fault Detection Performances analysis for Stochastic Systems based on

Adaptive Threshold

Author(s): Marwa Houiji, Rim Hamdaoui and Mohamed Aoun (Tunisia)

Abstract – This paper investigates the problem of fault detection for discrete linear systems subjected to unknown disturbances, actuator and sensor faults. A bank of Augmented Robust Three stage Kalman filters is adapted to estimate both the state and the fault as well as to generate the residuals. Besides this paper presents the evaluation of the residuals with Bayes test of binary hypothesis test for fault detection to adaptive threshold compared with fixed threshold, this test would allow the detection of low magnitude faults as fast as possible and with a minimum risk of errors, the increase of detection probability and the reduction of false alarm probability.

Paper Reference: (SAC-2-3) 1570233509

Title: Automated Life Stand Advances Nanotechnologies

Author(s): Hamed Ershad and Richard Fertell (USA)

Abstract – Implementation and Benefits of an Automated Instrumentation System for Reliability, Aging and Accelerated Life Testing of Liquid Flow Rate Measuring Instruments used in Semiconductor Manufacturing Process Control and Nanotechnology design with real-life automated test system.

Paper Reference: (SAC-2-4) 1570237975

Title: Sensor Fault Tolerant Control Strategy for Autonomous Vehicle Driving

Author(s): Ryad Boukhari, Ahmed Chaibet, Moussa Boukhnifer and Sébastien Glase (Tunisia–France)

Abstract – This paper is dedicated to the sensor fault tolerant control scheme for autonomous vehicle driving. The nonlinear lateral vehicle model is described by the fuzzy Takagi-Sugeno (TS) model. The contributions aspects of this work consist of the development of a descriptor observer to estimate the states system and faults by ensuring robustness against external disturbances. The gains of this observer are obtained by solving the LMI constraints, which are developed using a \mathcal{L}_2 gain technique and H_∞ criterion. Indeed, the proposed fault tolerant control strategy is justified by its ability to maintain an acceptable performance in the presence of the sensor failure. Simulation results are addressed to demonstrate the capability of this fault tolerant control to counteract the effect of the sensor fault.

Paper Reference: (SAC-2-5) 1570237976

Title: Mechanical Sensor FTC using Sub-Optimal Sliding Mode Observer for Electrical Vehicle Induction Motor

Author(s): Aziz Raisemche and Ahmed Chaibet, Moussa Boukhnifer and Demba Diallo (France)

Abstract – In this paper, we propose an experimental study for hybrid voting algorithm based on observer and robust control design for two mechanical sensor faults. The proposed strategy is applied for the induction motor speed drive of electrical vehicle powertrain. To adopt the best performance method for electrical vehicle application, we illustrate the effectiveness of the hybrid voting algorithm approach with the New European Driving Cycle (NEDC)

speed profile. The experimental results demonstrate the effectiveness of the proposed Input/Output FTC architecture.

Paper Reference: (SAC-3-1) 1570223529

Title: Decentralized Observer-Based Control of a nonlinear interconnected systems with nonlinear dynamics

Author(s): Ghazi Bel Haj Frej, Assem Thabet, Mohamed Boutayeb and Mohamed Aoun (Tunisia–France)

Abstract – In this paper, a method for the design of decentralized state observer-based control for a class of systems which are presented as nonlinear subsystems linked by nonlinear time varying interconnections. The non linearity of each subsystem satisfies the Lipschitz condition and the only information about the nonlinear interconnection is that satisfies a quadratic constraint. The key to our work is, in one hand, the reformulation of the Lipschitz condition and the quadratic constraint using the differential mean value to simplify the design of estimation and control matrices gain and in another hand the use of the Lyapunov’s direct method stability analysis. Sufficient condition that ensure the existence of observer based feedback controller are established in terms of linear matrix inequalities. A numerical example is given to mark the effectiveness of the control design.

Paper Reference: (SAC-3-2) 1570224348

Title: Observers for nonlinear Lipschitz discrete time systems with extension to H_∞ filtering design

Author(s): Noussaiba Gasmı, Assem Thabet, Mohamed Boutayeb and Mohamed Aoun (Tunisia–France)

Abstract – This note focuses on state observer design for a general class of nonlinear discrete-time systems. The main contribution lies in the use of the differential mean value theorem (DMVT) to transform the nonlinear error dynamics into a linear parameter varying (LPV) system. This has the advantage of introducing a general condition on the non linear functions. An extension to H_∞ filtering design is obtained for systems with linear and nonlinear outputs. LMI conditions are presented to ensure asymptotic convergence. Then performances and accuracy of the results are illustrated through simulation examples.

Paper Reference: (SAC-3-3) 1570233341

Title: Design of Disturbance Observers for Nonlinear Discrete Time Systems

Author(s): Abdulwahid A. Al-Saif (Saudi Arabia)

Abstract – This paper is concerned with the design method of state and disturbance observers for discrete-time nonlinear systems. An augmented model is constructed by assuming that the estimated disturbance is in state-space variable form.. A sufficient condition for the existence and convergence of the robust observer is proposed in terms of linear matrix inequality (LMI). The gains of the state and disturbance observers are obtained via solving the LMI. Finally, a numerical example is given to show the effectiveness of the proposed method.

Paper Reference: (SAC-3-4) 1570234858

Title: Lyapunov Stability Bounds Mapping for Descriptor and Switching Systems

Author(s): Rick Vosswinkel, Frank Schrödel, Nils Denker, Dirk Abel, Klaus Röbenack and Hendrik Richter (Germany)

Abstract – Calculating the stabilising parameter space of descriptor and switching systems is non-trivial. In this paper a new approach for the stability region calculation for descriptor and switching systems is presented by using a Lyapunov stability mapping method. This method has several advantages over the existing parameter space approaches. Currently, the calculation of the complex root boundaries relies on frequency sweeping or decoupling at singular frequencies. The new proposed method avoids this while reducing the computational complexity and increasing the practicality of the method at the same time.

Paper Reference: (SAC-3-5) 1570244508

Title: Chaotification of permanent magnet DC motor using discrete nonlinear control

Author(s): Sana Ben Jemaâ and Moez Feki (Tunisia)

Abstract – In this paper, a new way of chaotifying a permanent magnet direct current motor is proposed. The idea consists in applying a discrete time nonlinear control to the motor to set up the chaotic behavior. Two control methods are presented. The first one is achieved by imposing a nonlinear discrete controller based on the square of the motor speed and in this case simulation results show flip bifurcations routes to chaos with the switching period or the desired speed being the bifurcation parameters. The second method is based on a switching control, in this case a series of boundary collision bifurcations lead to chaotic behavior if we increase the gain of the controller.

Paper Reference: (SAC-4-1) 1570233235

Title: On the stabilization of a certain class of Takagi-Sugeno fuzzy systems

Author(s): Mohamed Ksantini, Mohamed Ali Hammami and Francois Delmotte (Tunisia-France)

Abstract – This paper deals with the problem of stabilization based feedback controller for a class of Takagi-Sugeno fuzzy nonlinear systems. Some sufficient conditions are given for the global stability of the closed-loop fuzzy control systems.

Paper Reference: (SAC-4-2) 1570233402

Title: A Simulation Study of Multi-Disciplinary Position Control Methods of Robot Arm D.C Motor

Author(s): Mohammed Mehdi Ali and Ali Al-Khawaldeh (Jordan)

Abstract – This paper presents a simulation study using different control strategies to control the position of robot arm DC motor. Fixed field DC motor mathematical model is applied using certain parameters settings. A

state feedback pole placement, Fuzzy Logic, Multi-Layer Perceptron (MLP) Neural Network, and the conventional PID control theories have been applied successfully. Matlab simulink work space is used in the simulation. Almost the same controlled output responses are obtained with a different transient responses speed.

Paper Reference: (SAC-4-3) 1570233442

Title: Adaptive 2D visual servoing using variable structure neural networks

Author(s): Hassen Makki (Tunisia)

Abstract – We are interested in this paper in the 2D visual servoing for a mobile robot using a Radial Basis Function (RBF) Neural Network (NN). In fact, the interaction matrix, expressing the relationship between the camera motion and the consequent changes on the visual features, contains some parameters to be estimated (depth) and requires a camera's calibration phase. Moreover, the model of the robot can contain uncertainties engendered by the sliding movement. An online identification, using the NN has been proposed to overcome these problems. The RBF NN is used to estimate the block formed by the interaction matrix and the model inverts of the robot. Actually, the variables number of the estimated function is important, which can cause a problem in the use of an excessive number of RBFs. As a remedy, we have proposed a new approach based on proving that a single point of the object is sufficient to solve the 2D visual servoing mobile robot problem. In order to keep only the useful neurons, we have used a variable structure NN whose the number of neurons can increase or decrease during the visual servoing.

Paper Reference: (SAC-4-4) 1570237771

Title: Modular platforms for e-mobility charging stations

Author(s): Sebastian Neujahr, Matthias Thümmler and Andreas Pretschner (Germany)

Abstract – The growing number of electric vehicles in urban areas needs an appropriate electrical charging infrastructure. The paper describes a strictly hardware- and software modularized charging station, their design principles and methodological approach.

Paper Reference: (SAC-5-1) 1570219204

Title: Identification of ARX Hammerstein Models Based on Twin Support Vector Machine Regression

Author(s): Mujahed Al-Dhaifallah and Nisar K. S. (Saudi Arabia)

Abstract – In this paper we develop a new algorithm to identify Auto-Regressive Exogenous (ARX) input Hammerstein Models based on Twin Support Vector Machine Regression (TSVR). The model is determined by minimizing two ε -insensitive loss functions. One of them determines the ε_1 -insensitive down bound regressor while the other determines the ε_2 -insensitive up bound regressor. The algorithm is compared to Support Vector Machine (SVM) and Least Square Support Vector Machine (LSSVM) based algorithms using simulation.

Paper Reference: (SAC-5-2) 1570219726

Title: Mean-Field-Type Games on Airline Networks and Airport Queues

Author(s): Alain Tcheukam Siwe and Hamidou Tembine (Italy–USA)

Abstract – In this paper we study the performance of hub-based airline networks. We design, model and analyze the interactions using mean-field-type game theory. We identify three types of interactions between within the game: interaction between passengers, passengers-airlines, and interaction between airlines. The key mean-field terms are the traffic flow (or frequency of flights), number of people at the same slot per flight/airline. In absence of congestion, there is a dominating strategy for a designer to adopt the Hub network leading a negation of Braess Paradox. However, when the frequency of flights increases due to demand, the Hub network is no longer superior and all the links will be used, leading to an Enhanced Hub Network. At an Enhanced Hub network, higher prices (could be congestion-dependent) are charged to passengers taking the longer direct flights compared to the ones who transit via the Hubs. We show that the resulting Stackelberg mean-field-type game with multiple leaders and multiple followers has an equilibrium and the equilibrium payoffs are compared in both type of networks. An analogy with communication networks is established with hybrid small base stations (femto, pico) and macro base stations. The small cell base stations help to work with low-power regime and save some energy. However, the femto cell network alone does not cover the entire area and does not dominate the market. It is shared with the enhanced macro cell.

Paper Reference: (SAC-5-3) 1570219727

Title: Network Security as Public Good: A Mean-Field-Type Game Theory Approach

Author(s): Alain Tcheukam Siwe and Hamidou Tembine (Italy–USA)

Abstract – We investigate dynamic public good games in networks consisting of strategic users with interdependent network security. The strategic users can choose their investment strategies to contribute to the basic security of the network. Mimicking the behavior of infection propagation over multi-hop networks which depends on the average degree of the network, we propose a mean-field-type model to capture the effect of the others' control actions on the security state. Using linear-quadratic differential mean-field-type games we propose and analyze two different regimes, examining the equilibria and global optima of each to address. We show that, generically, each user has a unique best response strategy to invest into security. Closed-form expressions are obtained using the recent development of mean-field-type game theory.

Paper Reference: (SAC-5-4) 1570219789

Title: On the Distributed Mean-Variance Paradigm

Author(s): Hamidou Tembine and Alain Tcheukam Siwe (Italy–USA)

Abstract – In this paper we study the distributed mean-variance paradigm with linear state dynamics of mean-field type in discrete time and several control inputs. The goal is to reduce the variance and the mean of the state in a fully distributed manner. We formulate and explicit solve the problem using recent development of mean-field-type games. We show that there is

unique best response strategy to the mean of the state and provide a simple sufficient condition of existence and uniqueness of mean-field equilibrium. We also provide a closed-form expression of the global optimum as a state-and-mean-field feedback strategy.

Paper Reference: (SAC-5-5) 1570233408

Title: Identification of nonlinear stochastic systems described by PARAFAC-Volterra model

Author(s): Imen Laamiri and Hassani Messaoud (Tunisia)

Abstract – In this paper we extend the Alternating RGLS (Recursive Generalized Least Square) algorithm proposed for the identification of the reduced complexity Volterra model describing stochastic nonlinear systems corrupted by AR (Auto Regressive) noise to case of systems corrupted by ARMA (Auto Regressive Moving Average) noise. The reduced Volterra model used is the 3rd order PARAFAC-Volterra model provided using the PARAFAC (PARAllel FACtor) tensor decomposition of the Volterra kernels of order higher than two of the classical Volterra model. The recursive stochastic algorithm ARGSL (Alternating RGLS) consists of the execution in an alternating way of the classical RGLS algorithm developed to identify the linear stochastic input-output models. The efficiency of the proposed identification approach is proved using Monte Carlo simulation on a nonlinear satellite channel.

Paper Reference: (SAC-5-6) 1570233428

Title: Model Based Predictive Control For linear Interconnected Systems

Author(s): Latifa Dalhoumi, Mohamed Chtourou and Mohamed Djemel (Tunisia)

Abstract – The control of linear interconnected systems has become an area of significant research thanks to its various applications. This paper proposes the determination of a predictive control strategy for linear processes. The main idea is to formulate an approach for designing the model Based predictive control (MBPC) for large scale linear interconnected systems. This approach consists on associating a sub-MBPC for each sub-system. In fact, this works introduces a strategy to solve problems caused by the interactions among subsystems. The robustness and efficiency of the proposed approach are illustrated through numerical example.

Paper Reference: (SAC-6-1) 1570232815

Title: Solar Car Optimization For the World Solar Challenge

Author(s): Moustafa Elshafei, Amro Al-Qutub and Abdulwahid A. Al-Saif (Saudi Arabia)

Abstract – This paper presents the details of an optimization method for the solar car's speed and battery management. The optimization method is demonstrated for the World Solar Challenge along a 3000km from Darwin to Adelaide, Australia. The optimization can be performed at any time during the race based on the current location, time, and battery status. The method predicts the required car speeds between the road land marks, taking into consideration the mandatory stops. The optimization includes the terrain

inclination, the car rolling resistance and aerodynamic resistance, and predicts available solar energy as function of position and time.

Paper Reference: (SAC-6-2) 1570232971

Title: Control Energy Comparison Between first and second Order SMC with Application to a SCARA Robot

Author(s): Fatma Abdelhedi Bouaziz, Yassine Bouteraa and Nabil Derbel (Tunisia)

Abstract – In this paper, a second order sliding mode control (SMC) design has been developed in order to realize a performant motion control task. The objective is to realize a robust trajectory tracking behavior while achieving a significant minimization of the control energy amount, inasmuch as the energy saving has been constantly considered as a key condition, especially in the industrial sector.

In a first step, a first order sliding mode controller has been developed and implemented on a robot manipulator system.

Hence, aiming to improve the proposed control strategy and to reduce the energy amount consumption, a second control law approach has been developed based on the second order sliding mode design. Finally, in order to achieve required objectives in the dynamic system control, a control energy comparison between the 1st and the 2nd order sliding mode approach has been accomplished to prove the effectiveness of the higher order SMC in eliminating disturbing oscillating control signals and preserving the control energy saving.

Paper Reference: (SAC-6-3) 1570233434

Title: Robust Walking Control Algorithm of Biped Robot in Rough Ground

Author(s): Imen Dakhli, Elyes Maherzi and Mongi Besbes (Tunisia)

Abstract – This paper presents an algorithm for controller's design used for a robust stabilization of biped robot's gait. The robot is described by a kajita's model with Norm bounded uncertainties to ensure a more realistic numerical model. The proposed robust dynamic controller relies on the use of predictive control theory (MPC) and the resolution of a convex optimization problem with Linear Matrix Inequalities (LMI) at every sampling period. The generated control law allows a real-time working robot even in rough ground or unknown environment.

Paper Reference: (SAC-6-4) 1570235788

Title: Semi-Analytic Finite Horizon Control of an Underactuated Manipulator

Author(s): Chenzi Huang, Klaus Röbenack and Carsten Knoll (Germany)

Abstract – In this paper we propose a method to generate piecewise constant control within finite time horizon for a nonlinear system. Local (weak) controllability related to accessibility properties with piecewise constant control is analyzed and used directly for control purposes. More precisely, we concatenate flows of vector fields of the system to generate appropriate constant input values. The method is applied to an underactuated manipulator model which fails to meet the Brockett condition but possesses controllability properties

which are also analyzed in this paper. Simulation results show the feasibility of this method.

Paper Reference: (SAC-6-5) 1570237342

Title: A real-time multi-objective PSO optimization of mobile robot trajectories

Author(s): Safa Ziadi, Mohamed Njah and Mohamed Chtourou (Tunisia)

Abstract – The Canonical Force Field (CF^2) method is an approach of mobile robot path planning. The variations of CF^2 parameters P , c , k , Q and ρ_0 are however vital to its performance. In this paper, we used the multi-objective particle swarm optimization (PSO) approach to optimize these parameters. The computation of the optimal parameters is restarted in each new position of the robot. PSO is used to minimize the distance between this position and the target and to maximize the safe distance between this position and the obstacles. The effectiveness of the method is demonstrated by computer simulations in the Webots environment. Simulations are carried out in various known and unknown environments. In the known environments, the obstacle position is recognized by the robot at the beginning of navigation and the path planning is global. But in the unknown environments, the robot localization is based on the sensor readings and the path planning is local.

Paper Reference: (SAC-6-6) 1570248559

Title: A surveillance camera algorithm based on the sliding mode approach with measurement's disturbance

Author(s): Marwa Fathallah, Fatma Abdelhedi Bouaziz and Nabil Derbel (Tunisia)

Abstract – The sliding mode control (SMC) is a variable structure, widely spread control strategy thanks to its efficient features such as robustness, easy implementation and reliability regarding disturbances and nonlinear uncertainties. Firstly, SMC has been implemented on a robot manipulator with 3-DOF used for a surveillance camera system. Then, and in order to improve the robustness of the proposed approach, an additive measurement's noise has been introduced. Simulation results show the efficiency of the sliding mode controller applied to a robot manipulator system in a motion control task, which is used to ensure the displacement of a surveillance camera.

Paper Reference: (SAC-6-7) 1570233342

Title: Online Policy Iteration Solution for Dynamic Graphical Games

Author(s): Mohammed Abouheaf and Magdi Sadek Mahmoud (Saudi Arabia)

Abstract – The dynamic graphical game is a special class of the standard dynamic game and explicitly captures the structure of a communication graph, where the information flow between the agents is governed by the communication graph topology. A novel online adaptive learning (policy iteration) solution for the graphical game is given in terms of the solution to a set of coupled graphical game Hamiltonian and Bellman equations. The policy iteration solution is developed to learn Nash solution for the dynamic graphical game

online in real-time. Policy iteration convergence proof for the dynamic graphical game is given under mild condition about the graph inter-connectivity properties. Critic neural network structures are used to implement the online policy iteration solution. Only partial knowledge of the dynamics is required and the tuning is done in a distributed fashion in terms of the local information available to each agent.

Paper Reference: (PSE-1-1) 1570218942

Title: Sampled Data and Space Vector Technique for Static VAR Compensation

Author(s): Jasim Ghaeb (Jordan)

Abstract – This paper presents a new method named Sampled Data and Space Vector Technique (SDSV) to control the three-phase voltages subjected to load changes. The proposed SDSV uses the on record and measured three-phase voltages to obtain the reference space vector (SV_r) and measured one (SV_m), respectively at different samples. The two space vectors SV_r and SV_m are compared at regular samples of the system sinusoidal cycle, to generate an error. This error is employed to produce the new reactive power of compensator in a small period of time rather than waiting for a complete system sinusoidal cycle, thereby allowing a quick and an efficient Volt- Ampere Reactive (VAR) control for the three-phase load voltages.

Paper Reference: (PSE-1-2) 1570221602

Title: Multi - Phase Current Source Cycloconverter Using Discrete Amplitude Modulation Technique

Author(s): Mohammed Lazim and Audih Al Faoury (Jordan)

Abstract – This paper proposed a new frequency changer which can be regarded as a current source cycloconverter. Frequency changing is achieved by mixing two or more amplitude modulated current waves at supply frequency using power transistors. By appropriate selection of the modulation indices and phase shift between the supply voltages, the supply frequency component can be entirely suppressed. The harmonics content of the resulting current wave is found to be very low. This converter solves the problems and severe restrictions associated with the ordinary full-cycle synchronous AM modulation when applied to three-phase and multi-phase systems. The process of conversion involves only natural commutation.

Paper Reference: (PSE-1-3) 1570222037

Title: SVC and TCSC assignment Multiobjective Optimization For Reactive Algerian Power System

Author(s): Messaoud Belazzoug and Mohamed Boudour (Algeria)

Abstract – The work presented is an original contribution to FACTS investment problem in an electrical network. This problem of combinatory is to determine the optimal number and the optimal locations of FACTS devices on a target. One of methods which have been implemented: Ellitist Non Dominated Sorting Genetic Algorithm (NSGA-II). Developments have been made for stationary operating modes of the network. In this context, several types

of FACTS have been studied and modeled: the static reactive power compensator, the compensator series thyristor and the unified power flow controller. One of the problems of the responsible of energy production and transport is the maintaining of an appropriate voltage profile by installation of reactive power supplies. Using the proposed method, the location, the kind and the rating of FACTS devices are optimized simultaneously with the active power flow. The problem to solve is multi criteria under constraints related to the load flow equations, the voltages, the transformer turn ratios, the active and reactive productions and the compensation devices. The Pareto front is obtained for continuous, discrete and multiple of five Mvars of compensator devices for the Algerian 114 nodes system.

Paper Reference: (PSE-1-4) 1570232947

Title: SMC for pitch angle of a variable speed PMSG-wind turbine considering actuator dynamics

Author(s): Marwa Ayadi, Fatma Ben Salem and Nabil Derbel (Tunisia)

Abstract – This paper aims to develop a novel pitch angle control for large variable speed wind turbine considering actuator dynamics. In fact, two Sliding Mode Controllers have been designed to achieve required performances. The first one is used below rated wind speed to maximize the extracted power. However, the second one is applied above rated wind speed to keep the power at the designed limits. Simulation results show good performances of the proposed control law.

Paper Reference: (PSE-1-5) 1570233453

Title: Current Control to Improve COP of Thermoelectric Generator and Cooler for PV Panel Coolin

Author(s): Yahya AL Hammad, Wagah Mohammed and Tarek A. Tutunji (Jordan)

Abstract – Hybrid car is an excellent solution to recover wasted energy in conventional cars. This reduces the use of global oil consumption; therefore, preserve the environment from extra pollution. In this work, the wasted heat energy from the exhaust system is utilized based on Peltier effect. Thermoelectric cooler (TEC) and thermoelectric generator (TEG) module are used to cool down and improve the efficiency of a solar panel fixed on car's roof. Using both TEG modules mounted on the exhaust system and TEC modules mounted on solar panel will ultimately cool down the solar panel. It is shown by MATLAB simulation that solar panel efficiency is improved by such cooling down the panel. The efficiency is increased by more than 60% when the temperature gradient is greater than 80 OC. A proposed model combination of TEG and TEC modules for optimal use of photovoltaic panel in hybrid applications is presented in this work. Calculations of the output electric power that is generated from TEGs on the exhaust and amount of heat dissipated from photovoltaic panel to the heat sink are performed. The main contribution is the derivation of mathematical model for current control that drives the TEG module to power the TEC module to achieve the optimal current to improve the coefficient of performance (COP).

Paper Reference: (PSE-1-6) 1570233568

Title: Investigation of SM DTC-SVM Performances of IM Control Considering Load Disturbances Effects

Author(s): Fatma Ben Salem and Nabil Derbel (Tunisia)

Abstract – This work is developed within the objective to discard load disturbances effects on the induction machine drives under DTC-SVM control. The paper is devoted to the presentation of a comparison study between two DTC-SVM strategies applied to the speed control of an induction motor: (i) a DTC-SVM control using PI controllers and (ii) a DTCSVM control using sliding mode controllers without and with gain load estimator. Firstly, mathematical fundamentals of both strategies are briefly formulated. Then, and considering a linear torque case, an adaptive load torque estimator is inserted in the speed loop in order to overcome the problem of load disturbance effects. Finally, simulation results dealing with steady-state as well as dynamic behaviors of the induction motor under both DTCSVM strategies are presented and compared. Simulation results clearly show that SM DTC-SVM strategy with load estimator offers the best performances and the load disturbances effects can be completely discarded.

Paper Reference: (PSE-1-7) 1570233650

Title: Control of Three-Level T-Type Inverter Based Grid Connected PV System

Author(s): Abdelmalik Zorig, Mohammed Belkheiri, Barkat Said and Abdelhamid Rabhi (Algeria-France)

Abstract – Multilevel inverters topology is an effective way to improve the capacity of full power converter in distributed generation system. However, the major concern for multilevel inverters is the fluctuation in the neutral-point voltage. This paper focuses on overall control including NP voltage balancing of a photovoltaic distributed generation system based on dual-stage conversion of three level DC-DC boost converter and three-level T-type inverter.

The voltage-balancing control of two split DC capacitors of the 3LT2I has been transferred to the 3LBC, and thereby there is no need to change the conventional three-level space vector modulation algorithm or to add additional components. Furthermore, it is simple and easy to implement and only one proportional-integral is needed to achieve good NP voltage balancing. Last, the capability of the overall system to control the current injected into the grid, reactive power compensation and keep DC-link NP voltage balance is investigated at different operating conditions.

Paper Reference: (PSE-1-8) 1570241193

Title: ECO-Design of an Electrical Railway Subsystem

Author(s): Ramzi Ben Ayed (France)

Abstract – In this work, an eco-design problem of a railway traction transformer associated to a fully-controlled IGBT rectifier is expressed as an optimization problem and solved by using a deterministic multi-objective algorithm. Results are shown as trade-off sets between the environment indicator

and the subsystem mass. The convenient solution will be chosen according to the price that consumers agree to pay for a reduced environmental footprint.

Paper Reference: (PSE-2-1) 1570230861

Title: Commercial losses in Jordanian Electrical System

Author(s): Audih Al Faoury and Ayman Agha (Jordan)

Abstract – The economic benefit from the electric power system is obtained when all generations, transmissions, distributions and the end users are operating at high efficiency. The higher efficiency tends to lower the electrical energy losses. This paper will concentrate on the losses (ΔE) components of the electrical system (ES), both technical losses (ΔE_T) and commercial losses (ΔE_C) will be discussed, their types, values, and their impacts on the overall performance of the (ES), with a special focusing on (ΔE_C) and black losses “thefts” (ΔE_{Bl}). In this paper, the analysis of the (ΔE) in Jordanian (ES) for the period (2008-2014) including the (ΔE_C) and (ΔE_{Bl}) is investigated and evaluated in details, the achieved results are compared to the works previously done, where the losses analyses for the period (1998-2007) has been conducted and presented. This paper tries to furnish answers to the questions: where; how and up to which value we can minimize the commercial losses (ΔE_C). What is the economic influence of (ΔE_C) in money (JD). Finally, conclusions and recommendations on the achieved results is discussed and introduced.

Paper Reference: (PSE-2-2) 1570233381

Title: Primary Reserves Management in Power systems

Author(s): Zahra Jlassi, Khadija Ben Kilani, Mohamed Elleuch and Chokri Bouchoucha (Tunisia)

Abstract – This paper deals with the impact of primary reserves management on the performance of frequency control. A parametric study is presented, investigating various primary reserves management strategies, and their impact on the performance of the primary control. Emphasis is on major emergency system faults. Methodologically, many study cases are defined in terms of allocated reserves volume, committed generators characteristics and governor controls. The study is conducted on a simplified model of the Tunisian transmission network. Loss of generation contingencies are simulated for the defined primary reserves settings and the results are compared in terms of frequency deviation critical values, leading to load shedding. The results are discussed and recommendations are made to improve the operational security of the system.

Paper Reference: (PSE-2-3) 1570233447

Title: Multilateral AC/DC interconnections of the Tunisian Power system. Modelling and technical benefits

Author(s): Adnene Haj Hamida, Ikram Nacef, Khadija Ben Kilani and Mohamed Elleuch (Tunisia)

Abstract – This paper presents a study on the Tunisian network with multilateral mixed HVAC and HVDC interconnections. First, a generic average model of the HVDC line is developed. The parameters of the HVDC link power

modulation controller are determined and tuned using the Graphical Identification method of "STRECJ". The multilateral ties of the system are studied via different study cases: single, bilateral and trilateral interconnections in DC and AC configurations. In particular, a parallel AC-DC interconnection between Tunisia and Libya is simulated. A special emphasis is given to an HVDC link to the Italian transmission grid. The results confirm the contribution of the HVDC transmission links in improving the Tunisian network stability.

Paper Reference: (PSE-2-4) 1570237765

Title: Smart City- urban quarters

Author(s): Martin Leutelt, Viktor Wolff and Andreas Pretschner (Germany)

Abstract – The transformation of a city into a smart city starts in urban quarters. Information and communication technology is a key factor for the implementation of smart solutions for a higher quality of Life in urban spaces. International Standards can be a solution for these future challenges. To link the important phenomena "smart city-smart grid-electric vehicle" the paper on the one hand suggests a methodical approach of the communication design between these complex systems and on the other hand considers their influence on the functional behavior of the power net.

Paper Reference: (PSE-2-5) 1570238276

Title: PMU Deployment for State Estimation in Smart Grids

Author(s): Nesrine Mekki and Lotfi Krichen (Tunisia)

Abstract – This paper presents an upcoming method searching for an optimal placement of phasor measurement units (PMUs) for power system state estimation. The proposed technique is based on phasor technology that allows to estimate the current status of the electrical network in a reliable and accurate way. In fact, looking for full system observability must take into account the lack of availability of appropriate data in all network nodes as well as the intervention of all renewable energy (RE) sources. Other investigations of FACTS systems are extended to enhance smart grid performances and its stability. Experimentally, the application of efficient placement strategies will help to allocate PMUs critically in a 5-bus test system

Paper Reference: (PSE-2-6) 1570251719

Title: Stabilization of multimachine power systems by PDC and optimal fuzzy controls

Author(s): Amor Kahouli and Hsan Hadj Abdallah (Tunisia)

Abstract – The power system models for transient stability studies are nonlinear and complex. In this way, the contribution of this paper is to present design methodologies for stabilization of the transient faulted power system. So, the nonlinear model is represented by a Takagi-Sugeno fuzzy model. Two fuzzy controls which are the fuzzy PDC (Parallel Distributed Compensation) control and the fuzzy optimal control are proposed and compared. For illustration purposes, these techniques are applied successfully to 4-machine system. A 3-phase to ground fault is considered on line between two buses.

Paper Reference: (PSE-3-1) 1570222536

Title: Modular Electrical Demand Forecasting Framework - A Novel Hybrid Model Approach

Author(s): Krischan Keitsch and Thomas Bruckner (Germany)

Abstract – In the face of a changing European power market, accurate electric load forecasts are of significant importance for power traders, power utility and grid operators to reduce costs for ancillary services. The following case study, based on publicly available load data, focuses on a novel approach to combine different forecasting methodologies and techniques from the area of computational intelligence. The proposed hybrid model blends input forecasts from artificial neuronal networks, multi variable linear regression and support vector regression machine models with fuzzy sets to intraday and day ahead forecasts. The forecasts are evaluated with commonly used metrics (MAPE & NRMSE) to allow a comparison to other case studies.

The results from the input forecasting models range from a yearly MAPE of 3.1% for the artificial neuronal network to 2.51% for the support vector machine. The blended forecast from the proposed hybrid model results in a MAPE of 1.2% for one hour and a MAPE of 2.03% for 24 hours ahead forecasts.

Paper Reference: (PSE-3-2) 1570223033

Title: Measuring the junction temperature of an IGBT using its threshold voltage as a TSEP

Author(s): Bastian Strauss and Andreas Lindemann (Germany)

Abstract – To ensure the thermally safe operation of a power electronic module, it is appropriate to monitor the junction temperatures T_j of its semiconductor devices. In addition, a condition monitoring of the power electronic module can be implemented by comparing the measured temperature data with model based calculated values. By means of long-term monitoring of T_j , it is possible to determine thermal weaknesses along the heat path between chip and heat sink as well as wearout of the electrical construction. However, since it is not possible to determine the junction temperature directly in standard applications, an indirect method of measurement will be applied. In this paper, the measurement concept for determining the junction temperature of an IGBT by using its threshold voltage V_{th} is described.

Paper Reference: (PSE-3-3) 1570233412

Title: Acoustic Emission for State-of-Health Determination in Power Modules

Author(s): Sebastian Müller, Christian Herold, Ulrich Heinkel and Chris Drechsler (Germany)

Abstract – In this article, a new method to measure fatigue mechanisms in standard module technology of semiconductor power devices is investigated. To detect this degradation we used the principle of acoustic emission. Our results have shown that observing the ageing process of the whole power module is possible with this method.

Paper Reference: (PSE-3-4) 1570233566

Title: Analysis and Co-Simulation of Permanent Magnet Synchronous Motor with short-circuit fault byFEM

Author(s): Manel Fitouri, Yemna Bensalem and Mohamed Naceur Abdelkrim (Tunisia)

Abstract – This paper attempts to present a Finite Element Analysis (FEA) and equivalent circuit simulation together for PWM inverter fed permanent magnet synchronous motor (PMSM) based on Ansys Maxwell and Simplorer. Using Maxwell environment, the initial value of the PMSM is calculated and the performance of the PMSM is optimized. By the built optimization model of the PMSM, static and transient analysis of the PMSM are modeled in Maxwell 2D. The power converter circuit and control circuit are established based on the Ansys Simplorer. Connecting Maxwell and Simplorer, the dynamic model of the PMSM is constituted. Based on FEA, this paper presents the effect of the short-circuit fault on the stator of the PMSM in the case of healthy and faulty conditions. The simulation results obtained with a Maxwell-Simplorer co-simulation.

Paper Reference: (PSE-3-5) 1570235632

Title: Modeling of Internal parameters of a lead acid battery with Experimental Validation

Author(s): Jihen Loukil Ferdaous Masmoudi Loukil and Nabil Derbel (Tunisia)

Abstract – In this paper, a suitable mathematical model of lead acid batteries has been presented. In order to imitate the real behavior of batteries and then to extract charge and discharge characteristics, the third order model has been proposed. An experimental test under real conditions has been set up. To identify internal parameters of battery cells, two methods have been suggested: (i) the identification using electrical characteristics established by the manufacturer datasheet, and (ii) the identification through a genetic algorithm. Recovered simulation results have been compared to those provided by the lead acid 12V/7Ah's datasheet and then have been validated by experimental works. Genetic algorithm becomes an useful tool for researchers to determine easily the parameters of battery models.

Paper Reference: (PSE-4-1) 1570233104

Title: Reliability Analysis of Distribution Systems with Hybrid Renewable Energy and Demand Side Management

Author(s): Maad Al Owaifeer and Mohammad AlMuhaini (Saudi Arabia)

Abstract – Reliability is, and will always be, a crucial mater in designing efficient smart distribution systems. Although renewable based DGs can largely improve the figure of reliability, they may also harm it due to their fluctuating nature. One of the key characteristics of smart distribution systems that could resolve this issue is the demand side management (DSM). DSM refers to any activity done by the utility or the customer to influence load behavior. There are many effective aspects of the DSM that, when addressed efficiently, could benefit both utilities and consumers. In this paper, a reliability assessment of a smart distribution local load system will be studied, including the DSM and

the integration of wind and solar energies. The impact of the wind and solar energies on the reliability of the local load will be addressed and compared to base-case reliability. Actual wind speed data and solar irradiation are used in modeling wind and solar power outputs to include seasonal variations. Then, the DSM concept will be implemented to assess the increase in load reliability. Two main DSM aspects are studied and simulated which are load shifting and peak clipping aspects. The Monte Carlo Simulation (MCS) will be utilized to evaluate the reliability for residential, commercial, and industrial loads.

Paper Reference: (PSE-4-2) 1570233303

Title: Reliability Evaluation of Solar-Storage Systems Using Markov Models

Author(s): Huthaifa Hussein and Mohammad AlMuhaini (Saudi Arabia)

Abstract – Electricity extracted from solar cells is a major renewable energy source which requires no fuel. However, the variability and uncertainty of solar radiation affects the output power of photovoltaic (PV) systems; hence, affecting the operation and planning of the microgrid system. This paper examines the reliability of a standalone PV system using a Markov model that considers the multi-state generation of solar modules. The developed model has the flexibility to incorporate failure and repair rates of each system component. The generation states probabilities are used to calculate the loss of load probability (LOLP) of the system.

Paper Reference: (PSE-4-3) 1570233305

Title: Reliability Assessment of Integrated Wind-Storage Systems using Monte Carlo Simulation

Author(s): Ibrahim Hussein and Mohammad AlMuhaini (Saudi Arabia)

Abstract – Due to increasing demand of electrical power over the world, the introduction of non-conventional power sources such as wind generators have become more essential. This paper introduces a reliability assessment method for an existing wind generator connected to the local loads. Random outages are imposed to load chronological data to simulate the grid failures using Monte Carlo simulation method. A comparison between the grid-connected load, the hybrid system that contains the wind generator with and without energy storage, and the standalone wind power system are studied and compared. This comparison is in terms of load reliability indices such as availability, average interruption duration index and average interruption frequency index. A sensitivity analysis is performed on different cases to investigate the effect of a system's parameter.

Paper Reference: (PSE-4-4) 1570233306

Title: Reliability Assessment of a Stand-Alone Hybrid System Using Monte Carlo Simulation

Author(s): Ahmad Saleem, Ibrahim Banat and Mohammad AlMuhaini (Saudi Arabia)

Abstract – Research on adequacy assessment on systems with integrated renewable generation sources has been going on for decades with increasing attention recently especially with standalone systems. Reliability assessment

of a stand-alone system that runs on Wind Turbine Generators (WTG), Photovoltaic (PV) modules, Batteries for storage and backup Micro Gas Turbines (MGT), with different configurations is carried out using Sequential Monte Carlo Simulation (SMCS) method. Some atmospheric data such as wind speed, solar irradiation, and ambient air temperature are needed to obtain the power outputs of the corresponding sources. Historical data was fitted into a Weibull distribution and the extracted scale and shape parameters were used to re-simulate the important factors of renewable generation power output models. The two-state reliability model was employed to obtain the adequacy model of the MGTs. The two-state reliability model was combined with the output power models to build the generation model of WTGs, PVs and batteries. The generation model was then tested on IEEE Roy Billinton test system (RBTS) as a load model. Reliability indices were computed for multiple case scenarios using different load types.

Paper Reference: (PSE-4-5) 1570234665

Title: Single and double diode models of solar cell with extraction of internal parameters

Author(s): Ferdaous Masmoudi Loukil, Fatma Ben Salem and Nabil Derbel (Tunisia)

Abstract – In this study, the cell behavior in a photovoltaic module will be investigated by using two characterization models of mono-crystalline solar cells: (i) the single diode model, and (ii) the double diode model. An identification algorithms of internal parameters of a photovoltaic cell using electrical characteristics provided by the manufacturer datasheet is suggested. Several of these parameters are not always provided by the manufacturer. Moreover, influences and variation effects of the temperature and the effective irradiance level is studied for the proposed models. Obtained simulations is compared to those provided by JAC M5SF-2 cell's datasheet. Then, the effectiveness of proposed models is validated against experimental tests under real operating conditions. These results show an acceptable correspondence with the data issued by the manufacturer. Identification algorithms, based on the rated data given by the manufacturer, can thus, be very useful for researchers or engineers to quickly and easily determine the internal parameters of any solar cell.

Paper Reference: (PSE-4-6) 1570235953

Title: RF parameters measurement of new telemetry process relating to an isolated photovoltaic site

Author(s): Youssef Oudhini, Fahmi Ghazzi and Lassaad Sbita (Tunisia)

Abstract – With reference to our recent publications [1] [2] [3], in which we proposed a new idea for data collection and organization in an isolated photovoltaic site and generating a text message process that will be entrusted to an FM broadcasting band. We also detailed the proposed techniques on PV site, then the transmission of the data stream to the broadcast center on a suitable transmission medium. Then we clarified the "transplantation" solution of the telemetry process on the 57 KHz sub-carrier available in FM-broadcast band, and performed a functional simulation of different contingencies disruption and distortions between different components of signals inside of this

frequency spectrum [2]. We claim to make in this article, the essential elements to ensure the proper conduct of the RF procedure in the presence of the "newborn" telemetry proposed process. For this, we installed a complete chain that contains a signal generator, a simple transmission line, a tuned FM modulator, an RF power amplifier and a measuring system composed by a network analyzer and a spectrum analyzer.

Paper Reference: (PSE-4-7) 1570244138

Title: Analysis and Implementation of Nonlinear Implicit DAE Solver Applied to a Photovoltaic Power System

Author(s): Mohamed Abdelmoula, Said Moughamir and Bruno Gerard Michel (France)

Abstract – This paper discusses an efficient method for handling the mixed Differential and Algebraic Equations (DAE's) of a stand-alone Photovoltaic Power System (PvPS). The beginning of the paper is a description of the PvPS DAE's. Next, one of most popular techniques for solving DAE's, the Backward Differentiation Formula (BDF), is applied to the PvPS problem. At the end, the solver performances are improved in order to obtain a suitable integrator for chaotic modes simulations.

Paper Reference: (PSE-4-8) 1570233349

Title: Novel Heuristic Solution for the Non-Convex Economic Dispatch Problem

Author(s): Nabil Nahas and Mohammed Abouheaf (Saudi Arabia)

Abstract – Economic Dispatch is one of the power system energy management tools that is used to allocate required power generation to a number of generating units to meet the active load demand. The high non-linearity of the power system imposes mathematical challenges in formulating the generation cost models, which makes the Economic Dispatch problem hard to solve. Heuristic optimization techniques are used to overcome the difficulties in optimizing certain performance objectives under some physical constraints. Novel heuristic technique is developed and used to solve the Non-Convex Economic Dispatch problem. This Heuristic technique is based on a Non-Linear threshold accepting functions. The simulation results of the proposed approach are very competitive and all of the obtained results are better or equal to the well-known best solutions of comparable heuristic techniques.

Paper Reference: (CSP-1-1) 1570227763

Title: Detecting Driver Drowsiness Based on Single Electroencephalography Channel

Author(s): Ibtissem Belakhdar, Walid Kaaniche, Ridha Djemal and Bouraoui Ouni (Tunisia-Saudi Arabia)

Abstract – In the recent years, driver drowsiness has been considered one of the major causes of road accidents, which can lead to severe physical injuries, deaths and important economic losses. As a consequence, a reliable driver drowsiness-detection-system is necessary to alert the driver before an accident happens. For this reason, an Electroencephalogram (EEG) has recently drawn

attention in the field of brain-computer interface and cognitive neuroscience to control and predict the human drowsiness state. Our objective in this work, is to proposed an automatic approach to detect the occurrence of driver drowsiness onset based on the Artificial Neuronal Network (ANN) and using only one EEG channel. In this study, an experiment has been conducted on ten human subjects using nine features computed from one EEG channel using the Fast Fourier Transform(FFT). After introducing these features in an ANN classifier, we have obtained a classification accuracy rate of 86.1% and 84.3% of drowsiness and alertness detection. All features used in this work are easy to calculate and can be determined in real time, which makes this approach adapted for embedded implementation.

Paper Reference: (CSP-1-2) 1570233017

Title: High quality arabic text-to-speech synthesis using unit selection

Author(s): Zied Mnasri and Raja Abdelmalek (Tunisia)

Abstract – This work aims to develop a high quality Arabic concatenative speech synthesis system based on unit selection. The original unit selection algorithm was modified to integrate more phonological, linguistic and contextual features in order to improve the selection cost calculation from one side, and more prosodic parameters for more exact concatenation cost estimation from the other side. The subjective assessments based on MOS (Mean Opinion Score) tests and visual comparison of waveforms show satisfactory results

Paper Reference: (CSP-1-3) 1570234580

Title: Statistical method for ECG analysis and diagnostic

Author(s): Chaouch Hanene (Tunisia)

Abstract – In this paper, a statistical method of ECG analysis and diagnostic is proposed. This method is based on three parts: the simplification using multiscaled PCA, the faults detection and localization by classic linear PCA. The first part consists of applying a multi-scale analysis based on continuous wavelet transform (CWT); it allows decomposing the signal into wavelet coefficients on five levels of multi-scale resolution. Then, we apply the principal component analysis PCA wholes on the coefficients obtained to determine the number of principal components to retain and which provide more information. The signal is reconstructed by referring only scales of resolution whose main components are found. In the second part, we introduce the resulting signal for detecting and localizing faults using PCA by introducing two statistics: SPE and T^2 . Variables are determined defective by the method of calculating contributions by the same previous statistics. Comparing the results obtained by this approach and the data of the expert proves its reliability in the diagnosis of ECG signal.

Paper Reference: (CSP-1-4) 1570235417

Title: Transient Analysis of NCLMS and ZNCLMS Algorithms

Author(s): Muhammad Moinuddin and Azzedine Zerguine (Saudi Arabia)

Abstract – This work presents a transient analysis of the recently proposed Noise Constrained Least Mean Square (NCLMS) and the Zero Noise Con-

strained LMS (ZN CLMS) algorithms. The analysis reported here is based upon the concept of the fundamental energy conservation relation and therefore on an easy manipulation of the analysis. Moreover, new stability bounds are derived to guarantee the mean-square-error convergence of the two algorithms. Furthermore, as a by-product of this analysis, the steady-state mean-square-deviation (MSD) is also derived for the first time for these two algorithms. Finally, simulation results corroborate the theoretical findings.

Paper Reference: (CSP-1-5) 1570237280

Title: An Intelligent Behavior-Based Fish Feeding System

Author(s): Hamzah S. AlZu'bi, Waleed Al-Nuaimy, Jonathan Buckley and Iain Young (United Kingdom)

Abstract – Traditional fish feeding mechanisms in today's aquaculture farms stand behind a variety of challenges including fish welfare, fish growth distribution, environmental effect especially in open ocean cage fish farms, and efficiency of the production cost. This paper presents the design and development of a new intelligent behavior-based fish feeding system. The proposed system is capable of customizing the amount of food depending on the actual need of the fish and thus improving fish welfare and maximizing the food conversion ratio. This is achieved by developing an adaptive fuzzy logic controller that runs two core-feeding algorithms; a scheduled feeder and smart feeder. Performance of the developed system prototype is assessed experimentally and the obtained results demonstrated. The proposed system is expected to unify the fish growth, improve fish welfare, and minimize food waste.

Paper Reference: (CSP-2-1) 1570222581

Title: MIMO Pre-Equalization and DFE for High-Speed Off-Chip Communication

Author(s): Lennert Jacobs, Mamoun Guenach and Marc Moeneclaey (Belgium)

Abstract – In this contribution, we present a multiple-input multiple-output (MIMO) transceiver scheme for high-speed chip-to-chip communication over low-cost electrical interconnects. Linear MIMO pre-equalization at the transmitter is combined with decision feedback equalization (DFE) at the receiver to counteract the adverse effect of inter symbol interference (ISI) and crosstalk (XT). Considering an energy constraint at the transmit side, we derive elegant closed-form expressions for the equalization filters under a minimum mean square error (MMSE) criterion. Numerical analysis shows that the combination of linear MIMO pre-equalization and MIMO DFE allows to significantly improve the reliability of future high-speed off-chip communication.

Paper Reference: (CSP-2-2) 1570223646

Title: Wavelet Transformation method to allocate the OFDM signals peaks

Author(s): Omar Daoud, Qadri Hamarsheh and Ahlam Damati (Jordan)

Abstract – This work makes use of the entropy in order to propose a wavelet transformation algorithm to detect the odd peaks. Furthermore, this algorithm has been used to enhance the Orthogonal Frequency Division Multiplex-

ing (OFDM) system performance based on combatting the peak-to-average power ratio (PAPR) problem. Three main stages are used to fulfill the process requirements; OFDM signal transformation based on the wavelet structure, thresholding process based on a predetermined criterion, and the filtration stage based on the moving filter. The proposed algorithm performance has been checked and validated not just numerically but also by a MATLAB conducted simulation. Furthermore, to check the simulation results, a comparison has been made to the literature; and shows promising results under the same bandwidth occupancy and systems limitations.

Paper Reference: (CSP-2-3) 1570235440

Title: OFDM Synthetic Aperture Radar based on Fractional Fourier Transform

Author(s): Ghazal Ba Khadher and Abdelmalek Zidouri (Saudi Arabia)

Abstract – This paper investigates the use of fractional Fourier transform (FrFT)-based Orthogonal Frequency Division Multiplexing for Synthetic Aperture Radar (SAR) imaging for single point target and extended target. The geometry of synthetic aperture radar using FrFT-based OFDM is presented with the developing algorithm to process the raw data to reconstruct the image of the target in the range and in the Azimuth direction. In the simulation results, single point target is assumed to be at the center of swath width to show the performance of this approach as well as the point spread function in the range and Azimuth direction. Extended target with the shape of tank is used to show the capability of this method in resolving extended target images.

Paper Reference: (CSP-2-4) 1570235590

Title: Building IPv6 Based Tunneling Mechanisms for VoIP Security

Author(s): Amzari Jihadi Ghazali, Waleed Al-Nuaimy, Ali Al-Ataby and Majid A. Al-Taei (United Kingdom)

Abstract – Internet protocol version 6 (IPv6) was developed to resolve the IPv4 address exhaustion problem and support new features. However, IPv6 still comprises some defectiveness of IPv4 protocol such as multimedia security. This paper presents IPv6-based tunneling mechanisms for securing Voice over Internet Protocol (VoIP) network traffic using OpenSwan IPSec (site-to-site). IPSec with Triple Data Encryption Algorithm (3DES) is used to create a Virtual Private Network (VPN) on top of existing physical networks. Secure communication mechanisms can therefore be provided for data and control information transmitted between networks. Secure VoIP-oriented mechanisms on VPN IPv6 have been designed, implemented and tested successfully using open source approaches. The performance of the IPv6 VoIP network is assessed experimentally in terms of several performance metrics including jitter, throughput and packet loss rate. The obtained results revealed that the proposed IPv6-based tunneling mechanisms for VoIP have negligible impact on network performance when compared to the previously reported work in literature, with a slight increase in the price of CPU and memory resources.

Paper Reference: (CSP-2-5) 1570245418

Title: Primary users identification in underlay cognitive radio

Author(s): Imen Sahnoun, Inès Kammoun and Mohamed Siala (Tunisia)

Abstract – In this paper, we consider an underlay cognitive radio system where secondary users can coexist with primary users in the same spectrum and region. To guarantee no interference to the primary network, the secondary base station (BS-S) needs to identify the active primary users (PUs) and to have a perfect or partial knowledge of the PU channels. For this aim, we assume that the BS-S is equipped with multiple antennas and not have any prior information about the channel from the PUs. We assume also that each PU uses a randomly rotated constellation for each transmitted symbol. Based on the received signals at the BS-S antennas, we propose a very efficient and reliable method for a blind identification of active primary users, without any energy or radio resource losses. Numerical results demonstrate the advantages of the proposed method.

Paper Reference: (CSP-3-1) 1570233431

Title: Personal verification system based on retina and SURF descriptors

Author(s): Takwa Chihouai, Hejer Jlassi, Rostom Kachouri, Kamel Hamrouni and Mohamed Akil (Tunisia-France)

Abstract – Today, Human recognition, especially based on retina, has been an important and attractive topic of scientific research. Most efforts in Biometrics tend to develop more efficient systems which compromise speed and robustness of authentication. In fact, retinal images often suffer from imperfections such as background intensity variation, affine transformations (translation, rotation, scale changes, etc.) variations from pattern to other. These defects can seriously affect features extraction in terms of quality and execution time. In this context, in order to overcome these defects, we propose in this paper a novel retinal verification system based on the Speeded Up Robust Features (SURF) extraction. This feature extraction method is so fast and invariant to the affine transformations such as rotation, scale changes and translation. We employ the Optical Disc interest Ring (ODR) method as a preprocessing step in order to further speed up the system and improve the performance. A subset of the VARIA database is used to evaluate the proposed SURF based system. It compromises a high quality with 100% of verification accuracy rate and a time processing very lower than existing verification systems.

Paper Reference: (CSP-3-2) 1570235287

Title: Comparative Analysis between a Variational Method and Wavelet Method PURE-LET

Author(s): Mohamed Fehri, Ghazouani Kaies and Nouredine El-louze (Tunisia)

Abstract – Poisson noise has been implemented by several methods and several approaches. This type of noise generally affects several types of images and in the whole case medical images especially those rebuilt after a X radiation. About it, as tests images are CT ones, further, we will present two methods derived from two different approaches to Poisson noise removal. one that is variational, which is a restoring process that takes into account the actual ap-

pearance of this noise which is multiplicative, the other methods derived from wavelet approach which is among the growing methods for the Poisson noise removal mainly in medical dataset. This method is called PURE-LET, simply to say Poisson Unbiased Risk Estimation-Linear Expansion of thresholds. This latter is based on of an optimization of statistical tool MSE or risk between the noiseless (restored) image and the noisy image. This estimator is optimized independently for each sub-band issue a unnormalized Haar DWT (discrete wavelet transform), exploiting the fact, the orthogonal decomposition of these latter and the stability of Poisson distribution (the sum of independent Poisson random variable is also a Poisson random variable whose intensity is the sum of original intensities). An original comparison at the end of this paper allows us to assess the reliability and robustness of either the variational method or the PURE-LET one against the annoying factors in medical imaging such as artifact, spatial resolution, etc. Finally, we come to the conclusion that the Variational method excels at the Pure-Let wavelet method.

Paper Reference: (CSP-3-3) 1570235949

Title: An Automatic Pattern Detection Method for Behavioral Analysis of Zebrafish Larvae

Author(s): Qussay Al-Jubouri, Waleed Al-Nuaimy, Majid A. Al-Tae, Javier Lopez Luna and Lynne Sneddon (United Kingdom)

Abstract – Zebrafish has becomes a popular biological model for studies in pain, stress and welfare. However, automated assessment of nociceptive thresholds in larval zebrafish remains a challenge for biomedical researchers. This paper presents a new automatic pattern detection method for behavioral analysis of zebrafish larvae. The proposed method divides each arena in the test-bed mesh into an inner and outer zone with the aim of detecting patterns of fish behavior in the outer zones (also called thigmotaxis or wall hugging) that is considered one of the most common behavioral patterns studied in anxiety models. Three distinct groups of fish larvae are used as test subjects in this study. These groups are exposed to electric stimulation using different voltage levels. Post-stimulation behaviors of the subjects under test are recorded using an infrared sensitive camera and analyzed. The obtained results demonstrated a noticeable change in the larval behavior in terms of the number of detected patterns in the outer zones of the arena cells. These findings confirm the validity of the proposed pattern detection method as a new metric to assess nociceptive thresholds for behavioral analysis of larvae.

Paper Reference: (CSP-3-4) 1570236425

Title: Analysis and Synthesis of Handwriting Movements via the Enhanced Beta-Elliptic Model

Author(s): Hala Bezine and Adel M. Alimi (Tunisia)

Abstract – On-line handwriting analysis and synthesis have become a topic of great interest over the last years and identified as a still-open research issue in various fields, including Artificial Intelligence. This paper proposes an artificial simulator for the analysis and synthesis of cursive handwriting signals based on the beta-elliptic model. The beta equation used for this model describes the velocity profile in the kinematics domain which, in turn, is rep-

resented by an elliptic arc that characterizes the handwriting trajectory in the static domain. The beta-elliptic model is used to develop a simulator model that produces both movement kinematic profiles, such as velocity and acceleration, and position patterns of the approximated handwriting trajectory. The model consists of three interconnected sub-systems constructed via the Matlab- Simulink tool. In order to test the performance of our proposed enhanced model and simplify the control and simulation of handwriting features, including movement amplitude, duration, and size, experimental cases were performed under ideal and noisy conditions. The results demonstrated the efficiency of the enhanced model in producing handwriting signals and its robustness in handling the variation of handwriting features.

Paper Reference: (CSP-3-5) 1570237170

Title: Arabic Sign Language Recognition Using the Microsoft Kinect

Author(s): Mohamed Mohandes, Saeed M. Badran and Mohamed Deriche (Saudi Arabia)

Abstract – Several studies have been carried on sign language recognition systems, however, practically deployable system for real-time use is still a challenge. Traditionally, sign language recognition systems have either used sensor gloves or digital cameras to acquire and process hand gestures. Both approaches exhibit some disadvantages for real time deployment that hindered its large scale adoption. With the growth witnessed in gaming systems, two new instruments have been introduced namely, the Microsoft Kinect (MK) and the leap motion controller. The MK system has been developed to interact with video games by tracking full body movements and gestures. To overcome some of the disadvantages of the classical methods, we propose here to develop an Arabic sign language recognition system based on MK system. The developed system was tested with 20 signs from the Arabic sign language dictionary. Therefore, in this paper, we present our experiment carried out using the MK setup on 20 Arabic sign language words. Video samples of both true color images and depth images were collected from native deaf signer. Linear Discriminant analysis was used for feature dimension reduction and sign classification. Furthermore, fusion from RGB and depth sensor was carried at feature and decision level giving an overall best accuracy of 99.8%.

Paper Reference: (CSP-3-6) 1570249197

Title: Designing a New Approach for the segmentation of the Cancerous Breast Mass

Author(s): Nadia Zghal (Tunisia)

Abstract – Breast cancer is now one of the main causes of death among women throughout the world. The diagnosis and separation of cancerous tumors in mammographic images require precise, experience and time, and he always posed himself as a great challenge for radiologists and physicians. Despite the immense danger that this disease presents, its curability is relatively high if it is treated early; that's why it is necessary to develop a computer-assisted diagnostic system (CAD) to facilitate the early detection of this cancer. In this paper, we have implemented such a system. The developed method proceeds in three steps: pretreatment mammograms to remove the breast area, segmen-

tation based on morphological operators to detect breast masses. Finally, the segmentation of the breast contour based on the method of Marching Square was adopted. Our approach has been tested on the basis of pictures"MIAS" showing its efficiency. In addition, a graphical interface was performed to facilitate the task for radiologists.

Paper Reference: (CSP-4-1) 1570229343

Title: Real-Time Patient Health Monitoring and Alarming Using Wireless-Sensor-Network

Author(s): Kasim M. Al-Aubidy (Jordan)

Abstract – The main objective of this research is design and realization of real-time monitoring and alarming system for patient health, especially for patients suffering from diseases during their normal life. The proposed system has an embedded microcontroller connected to a set of medical sensors (related to the patient case) and a wireless communication module (Bluetooth). Each patient is considered as a node in a wireless sensor network and connected to a central node installed at the medical center through an internet connection. The embedded microcontroller checks if the patient health status is going well or not by analyzing the scanned medical signals. If the analysis results are abnormal, the embedded unit uses the patient's phone to transmit these signals directly to the medical center. In this case, the doctor will send medical advice to the patient to save his/her life. The implemented prototype has been tested and calibrated with standard devices. The experimental results confirm the effectiveness of the proposed system that is accurate in scanning, clear in monitoring, intelligent in decision making, reliable in communication, and cheap (about 120 US Dollars).

Paper Reference: (CSP-4-2) 1570233469

Title: Energy Efficient Smart Cooling System using WSN

Author(s): Jetendra Joshi, Anshumali Singh, Lakshya Gourav Moitra and Manash Jyoti Deka (India)

Abstract – In this era of latest technologies and innovation, energy consumption is a key feature which requires special attention while implementation of a system. One of such evolving technologies is Wireless sensor networks (WSN). We have seen a huge amount of progress in the research has been going on in the field of WSN recently. The improvement in home automation technology and other luxury systems has made comfort a key factor in today's life. In this paper we have shown the integration of a comfort cooling system with the cloud. Iris motes are used for monitoring and controlling the room temperature. The system uses Low-Energy Adaptive Clustering Hierarchy (LEACH) algorithm to make the system energy efficient. The iris motes used to control the temperature are connected to a stepper motor installed in the air outlet. The efficiency of the system is compared with that of Ad-Hoc Distance Vector (AODV) routing protocol. This system was tested with an Earth Air Tunnel (EAT). This integrated system shows the versatile nature of WSN keeping in mind the low power consumption and reliable data transfer. This tested system provides a pollution free environment as it uses Earth's geothermal energy for cooling and not CFC based cooling systems like that of Air Conditioners

hence keeping the environment clean and green. The data accumulated is uploaded directly in the cloud so that we can monitor from any location in the world and in order to show this we have designed an android application which controls the system.

Paper Reference: (CSP-4-3) 1570233511

Title: When Social Networking meets Internet of Things

Author(s): Jetendra Joshi, Anshumali Singh, Manash Jyoti Deka and Lakshya Gourav Moitra (India)

Abstract – Nowadays, sensors are utilized everywhere, and by the medium of smart phones, they're reaching each corner of the world. Within the world of IoT (Internet of things), the novel paradigm of "social network of intelligent objects" with its foundation on the perception of "social relationships" among objects. The objects are capable of creating social relationships in associate autonomous manner with relevance their house owners with the advantages of up the network quantifiability in info and repair discovery. During this paper we have a tendency to examine the potential of mixing social and technical networks to collaboratively offer services to each human users and technical systems. We have a tendency to additionally explain the design of social IoT, main processes and perspective of Social IoT. The mixing of social networking ideas into the web of Things is additionally studied.

Paper Reference: (CSP-4-4) 1570235257

Title: Experimental Testbed for Video Streaming Analysis Based on RTMF Protocol

Author(s): Majid A. Al-Tae, Ala Khalifeh and Ayman Mursheed (United Kingdom–Jordan)

Abstract – Internet-based video communications have been gaining increasing popularity in recent years and thus, the need for improving quality of service has become an essential requirement. This paper presents an experimental testbed that is based on the real-time media flow protocol (RTMFP). The proposed testbed enables experimental investigations of the impact of key video-quality parameters such as the frame quality, frame rate, and resolution on the video quality at various speeds of video streaming, and network conditions. It also allows for developing adaptation algorithms that can be utilized in real-time video transmission to ensure delivery of best service possible under various network conditions. The hardware and software aspects of the testbed are presented along with the practical setup and configuration commands. Some of the practical challenges faced throughout the implementation and test phases are presented. Performance of the developed prototype is assessed experimentally and some of the obtained results are also presented and discussed.

Paper Reference: (CSP-4-5) 1570235890

Title: Mobile Workflow Management System Based on the Internet of Things

Author(s): Zahra Muhsin, Anas Al-Tae, Majid A. Al-Tae, Waheed Al-Nuaimy and Ali Al-Ataby (Jordan–United Kingdom)

Abstract – The Internet of Things (IoT) is an emerging computing concept, which fuses the digital world and the physical world by bringing together different concepts and technical components. In this paper, we present a new mobile workflow management system (MWfMS) that handles the service of computer and peripherals repair and maintenance. It allows for (i) submission of service requests, (ii) provision of real-time notifications on work progress, (iii) automatic assignment and distribution of workload among the technical-support staff, and (iv) provision of quick solutions to known problems taken from database, without having to register for a new service request. The proposed MWfMS comprises a physical layer linked by the Internet to a remote workflow management hub (WfMH). The real objects (i.e. system stakeholders and their mobile devices) represent the physical layer. The WfMH that hosts the main business logic and data storage is responsible for virtualization of physical objects, and creation and delivery of various management services to the end users. A fully functional prototype of the proposed system is designed and developed and its end-to-end functionality is tested successfully.

Paper Reference: (CSP-4-6) 1570237774

Title: DNSec - Data Security in Dynamic Industrial Networks

Author(s): Felix Schreiner and Andreas Pretschner (Germany)

Abstract – Modern industrial networks and fieldbuses are designed to provide a tough and efficient communication between all connected peers. Complex data stream modifications like encryption or compression are often omitted to ensure functionality and compatibility. The DNSec project aims to add these features while retaining typical characteristics of dynamic industrial networks.

Paper Reference: (CSP-5-1) 1570216150

Title: An Efficient FPGA Circuit Design for speeding up Cache LRU Replacement Algorithm

Author(s): Naser Halasa and Ali Titinchi (Jordan–Oman)

Abstract – Although the LRU replacement algorithm is realizable in principle for cache memory management, but it is of little use to the operating system designer if there is no hardware implementation for it. This paper presents an implementation using FPGA technique to achieve the LRU algorithm in hardware. The design shows an excellent improvement in speeding up the response of the LRU algorithm for the Hit/Miss cache requests. Moreover, the FPGA facilities grant us the flexibility to work with different cache memory sizes and to keep track of long access history. For the validation of the proposed approach we have used Xilinx ISE 9.2i for simulation and synthesis purposes. The prescribed design was implemented in Verilog.

Paper Reference: (CSP-5-2) 1570233274

Title: Noise Reduction Using Multi-Channel FIR Warped Wiener Filter

Author(s): Aida Shamsa, Seyed Ghorshi and Marjan Joorabchi (Iran)

Abstract – Enhancing the speech quality is the aim of noise reduction techniques. In order to have a desirable speech signal, it is necessary to eliminate the hearing fatigue and enhance the quality and intelligibility of speech sig-

nal. The presence of additive noise causes the signal to degrade where the noise reduction techniques intend to remove the effect of noise on speech signals. However, removing the noise should not harm the speech signal when the signal is going to be heard. In this regard, Wiener filter can be used to promote the quality and intelligibility of the noisy signals. This paper explores the performance of multi-channel Wiener filter accompanied by Warped FIR filter.

Paper Reference: (CSP-5-3) 1570233432

Title: Antipodal Vivaldi Antenna with improved radiation performances for UWB applications

Author(s): Rabiaa Herzi (Tunisia)

Abstract – This paper presents an Antipodal Vivaldi antenna with elliptical dielectric director for UWB applications. In order to get ameliorated radiation performances for the antipodal Vivaldi antenna, an elliptical dielectric director with elevated permittivity is associated to the end of the antenna aperture. The dielectric director has the ability to drive the most of the energy in its direction. This structure offers a radiation pattern with high gain, tapered beamwidth and smaller side lobe level and good input match over an Ultra Wideband frequency of 2.3 to 15 GHz

Paper Reference: (CSP-5-4) 1570249286

Title: Methodology of Embedded System Design for Underwater Vehicle

Author(s): Omar Triki and Trabelsi Hafedh (Tunisia)

Abstract – In this paper we describe our methodology of design a new class of underwater vehicle with high navigation ability. We describe our process of design and we focus on main factors behind developing such prototype. Moreover, we describe this vehicle based on customer specifications and the application requirements of this class of underwater vehicle. Finally, the control structure is implemented.

Paper Reference: (CSP-6-1) 1570223060

Title: Analysis of Low-Altitude Aerial Sequences for Road Traffic Diagnosis

Author(s): Khaled Kaâniche (Tunisia)

Abstract – This article focuses on an original approach aiming the processing of low-altitude aerial sequences taken from an helicopter (or drone) and presenting a road traffic. Proposed system attempts to extract vehicles from acquired sequences. Our approach begins with detecting the primitives of sequence images. At the time of this step of segmentation, the system computes dominant motion for each pair of images. This motion is computed using wavelets analysis on optical flow equation and robust techniques. Interesting areas (areas not affected by the dominant motion) are detected thanks to a Markov hierarchical model. Primitives stemming from segmentation and interesting areas are used to build a graph on which partitioning process is executed. This graph gathers only the primitives (considered as nodes) which belong to the interesting areas. Nodes are interconnected by Perceptive Criteria. To extract the important elements of the sequence (vehicles), a bi-partition of

this graph using Normalized Cuts technique takes place. Finally, parameters of proposed algorithm are chosen thanks to a learning stage for which we use Genetic Algorithms.

Paper Reference: (CSP-6-2) 1570223240

Title: Design And Implementation Of Intelligent Doorbell Based On Face Recognition

Author(s): Nidhal Ben Amor–Ayman Ben Thabet (Tunisia–Germany)

Abstract – Access systems based on biometric have witnessed an observable revolution. The multiple access ways such as voice recognition, finger print scanning, password key systems and face identification configure less utilized ways among the biometric access procedures. Face identification, which authenticity is based on the correspondence of the person’s face, constitutes a highly complex algorithm including different technics. This paper endeavors to successfully implement a face identification software code, which is based on a modified method of Principal Component Analysis implemented on the Raspberry Pi platform with a real time recognition while previous work on the above platform were infirm and indeterminist to real time constraints. Within this article, we describe the attempt of implementing face recognition algorithm on a hardware platform which was simple, efficient and low cost. This work is dealing with the Raspberry Pi development platform which is a System on Chip board supporting an ARM11 processor and Image capture device is based on a Linux compliant USB webcam. Face detection and recognition codes are both developed in Python.

Paper Reference: (CSP-6-3) 1570223454

Title: Vehicle detection and tracking from aerial video sequence: a survey

Author(s): Khaled Kaâniche (Tunisia)

Abstract – This paper present a critical survey on recent vehicle detection and tracking applications from aerial video sequence. Our focus is on systems where the camera is mounted on Manned or Unmanned Aerial Vehicles (AV/ UAV) rather than being fixed on buildings such as in the classic traffic surveillance systems. With a moving camera two different motions are present in the scene. The dominant one is from the dynamic behavior of the camera and the second one is from the moving objects present on the scene. To detect the significant one, which represents the moving vehicles, many techniques are presented. Some of them use the vehicle shape and characteristics, others include extrinsic information of the camera like GIS mapping or GPS information and others work without any prior information and use only the content of the image to detect vehicles. Advantages and drawbacks of each technique are explained using recent systems from the literature.

Paper Reference: (CSP-6-4) 1570235256

Title: Towards Nationwide Electronic Health Record System in Jordan

Author(s): Majd AlZghoul, Majid A. Al-Tae and Anas Al-Tae (Jordan–United Kingdom)

Abstract – Most of the hospitals, medical centers and outpatient clinics in Jordan have made major investments in transferring their manual health records to electronic health records (EHRs). However, heterogeneity and lack of appropriated middleware made these EHRs inaccessible on the national level despite the availability of advanced telecom infrastructure in the country. This paper presents a new central middleware architecture that enables seamless and secure exchange of data and services between the local EHRs and a remote national EHR database system. The proposed middleware tackles a standing interoperability problem between these distributed healthcare entities and thus enables the caregivers to access EHRs of their patients on the national level without restrictions of time or geographical location. This is achieved by developing a structured form of interoperability between distributed clients and servers and the central EHR database server that simplifies the integration process and shifts the complexity towards the central middleware system. The developed pilot middleware prototype has demonstrated seamless and secure exchange of data and services.

Paper Reference: (CSP-6-5) 1570237281

Title: Horse Stress Analysis Using Biomedical Modelling and Machine Learning Approach

Author(s): Hamzah S. AlZu'bi, Waleed Al-Nuaimy and Iain Young (United Kingdom)

Abstract – Horse transport by road is responsible for high-stress levels that may exceed the levels caused during professional horse races. Stress symptoms are reflected in the physiological functions of horses leading to horses suffering from horses fatigue or the injury. This paper suggests a new biomechanical model for the vibration forces caused by the vehicle movement during transport. The fore and hind limbs of the horse are each (i.e. skeletal-bone segments). The movement of each of these segments can be measured using a low-cost set of accelerometers. The relationship between these forces and the stress that the horse experiences during transport, is then studied using a machine learning approach. Identification of a direct relationship between the vehicle vibration forces and high-stress levels that horse experiences during transport will lead to development of a low-cost non-invasive early stress detection system without the need to assess physiological responses of the horse.

Paper Reference: (CSP-6-6) 1570238600

Title: Occurrence Density Index for Behavior Classification of Zebrafish Larvae
Author(s): Qussay Al-Jubouri, Waheed Al-Nuaimy, Majid A. Al-Tae, Javier Lopez Luna and Lynne Sneddon (United Kingdom)

Abstract – Larval zebrafish are proving to be promising subjects for research that is not subject to legal requirements. However, the behavior of this animal has not been fully explored by researchers yet. This paper proposes a new occurrence-density index (ODI) for behavioral analysis and classification of zebrafish larvae. The ODI is identified through a multistage process that includes (i) mapping of the testbed arena into a virtual arena, (ii) projection of the original object's trajectory into the virtual arena, (iii) assessment of

the occurrence-density, and (iv) calculation the proposed index. The results obtained from this pilot study clearly demonstrated a promising ability to classify behaviors of zebrafish larvae. The ODI will therefore not only provide a new classification feature to the known set of features for fish behavior analysis but also explain and distinguish different behavioral traits.

Paper Reference: (CSP-6-7) 1570219050

Title: Over Hang Slant Cracked Rotor Vibration Signal Processing Based On Discrete Wavelet Transform

Author(s): Yavar KeshtKar Maleki, Mehrdad Nouri Khajavi, Gholamhasan Payganeh, Mir Saeed Safizadeh and Safura Shurumi (Iran)

Abstract – This paper presents an application of discrete wavelet transform (DWT) as a machine vibration monitoring and signal processing method on a rotor dynamic response with a propagating slant crack. The research method is experimental. A test rig has been designed and manufactured in order to perform the tests and cracked rotating shaft diagnostics. Vibration signals have been taken from pedestals supporting of the shaft. The best mother wavelets for time series signal processing and denoising determined via "maximum energy to Shannon entropy criterion". Integrated DWT-FFT results showed that 4X harmonics rise with slant crack propagation. 2X harmonics rise due to load increase but 4X harmonics has no correlation cross load increase.

Paper Reference: (SCI-1-1) 1570232948

Title: CMOS Cascode Structure Current Reference for Low Power Temperature Sensor

Author(s): Nam-Soo Kim, Jusang Park, Junho Yu and Yongsik Kim (Korea)

Abstract – This paper proposes a low power CMOS temperature-to-current generator (TCG) for voltage-mode smart temperature sensor which is composed of bias circuit, proportional-to-absolute-temperature (PTAT) current generator, and differential current generator. The multiple-block system is to obtain a reference voltage which is dependent on temperature and is applied for a temperature sensor. The current references and cascode structure are applied in PTAT current generator. In differential current generator, current mirror and reference current are used to obtain a temperature sensing current. Low power TCG is designed with $0.35\mu\text{m}$ CMOS process. Simulation test shows that the proposed TCG is operated up to $120\mu\text{A}$ with power dissipation of 2 mW. The sensing current shows to increase linearly with increase of temperature in the ranges of 30–80 °C.

Paper Reference: (SCI-1-2) 1570233415

Title: Development of an Analytical Method for IMU Calibration

Author(s): Sitank Bhatia, Hai Yang, Rui Zhang, Fabian Höflinger and Leonhard Reindl (Germany)

Abstract – In today's world, where drones, remotely controlled vehicles, aircrafts and other autonomous vehicles have become a common mode of carrying

out various operations, the Inertial Measurement Units (IMUs) find themselves playing a very prominent role in the field of navigation. IMUs use a combination of accelerometers, gyroscopes and magnetometers to determine the velocity, orientation and gravitational forces acting on the object, they're mounted upon. The sensor outputs of an IMU are not completely accurate and are coupled with errors. This paper focuses entirely on developing a new calibration method for an IMU. A theory was proposed which required the implementation of analytical operations using the basic sensor error model, eliminating the use of expensive hardware and inaccuracies from approximation methods involved. The IMU is moved by hand and placed in different static positions, and then with the help of analytical algorithms developed, the sensor errors were deduced. The performance of the calibration algorithm developed was tested and verified successfully with a commercially available device.

Paper Reference: (SCI-1-3) 1570235540

Title: Design and FEM analysis of multi segment capacitive level sensor based on local and global E-fields

Author(s): Fovad Ali Khan (Germany)

Abstract – This paper presents various designs of a multi segment capacitive level sensor for fluid monitoring. Among the investigated designs, the mixed model (with global and local E-field or electric fields concept) of capacitive level sensor probe encompasses an efficient sensitivity which is approximately same as basic model (without global and local electric fields concept) of sensor. The main advantage of mixed model is to simultaneously detect the coating effect on the sensor by using local electric fields and the continuous level monitoring by global electric fields. The capacitive level sensor probe is based on basic model with a length of 1 m which is divided into 11 segments. Each segment has a length and separation distance of 89.5 mm and 1.55 mm respectively. Polypropylene material is used for insulation in between the sensor and fluid. Finite element method analysis is used as a main tool to examine the sensitivity of the various designs in different permittivity of liquids. An algorithm is also developed and measurements are evaluated for a basic model.

Paper Reference: (SCI-1-4) 1570235717

Title: Observation of bubbles inside cryogenic liquids using capacitive multi-electrode sensors

Author(s): Christoph Kandlbinder, Alice Fischerauer, Gerhard Fischerauer, Martin Siegl, Jens Gerstmann, Tristan Zuerl and Tobias Helling (Germany)

Abstract – Investigation of fluid phenomena is of high interest in the management of cryogenic liquid propellants. In order to efficiently design orbital cryogenic propellant storage facilities or cryogenic propulsion systems experiments concerning fill-levels, bubble formations and boiling have to be conducted. Thus measurement devices are needed that can give insight into the spatial distribution and the behavior of the cryogenic fluids. One possibility is to use a capacitive system with electrodes embedded into the walls of the vessel. In this paper experiments with such a system at cryogenic temperatures

are presented. To simulate the behavior of rocket fuel in space a cryostat was filled with liquid nitrogen and by way of controlling the pressure inside bubbles were created or the liquid/gas interface brought to boiling. Two systems have been submerged into the cryogenic liquid. One system comprising only five electrodes was used to trap many small bubbles so that they could coalesce into a big single gas volume. The other system used 16 electrodes arranged along the circumference of a carrier ring. With these systems the filling level inside the bubble trap was observed and rising bubbles detected and quantified by measuring the mutual capacitances of selected electrode pairs. To interpret the measurement results FEM simulations have been conducted that are utilized to generate a characteristic curve for the relationship between filling level and measured capacitances. In addition two cameras were mounted inside the cryostat which allowed the simultaneous recording of the filling level and the existence of bubbles.

Paper Reference: (SCI-1-5) 1570235882

Title: WO3 sensors array coupled with pattern recognition method for gases identification

Author(s): Rabeb Faleh, Mehdi Othman, Sami Gomri, Khalifa Aguir and Abdennaceur Kachouri (Tunisia–France)

Abstract – This paper presents the performance of gas sensors as electronic nose coupled with pattern recognition method for gases identification. In fact, the implementation of the electronic nose in a characterization process is based on two fundamental phases: a learning phase and a phase of identification. That is why we need an accurate extraction method in order to obtain performant classification. In this study, we propose to extract transient parameters in a dynamic mode: derivate and integral. The performance of these features is validated by the analysis method: principal component analysis (PCA) and K nearest neighbors (KNN), which present 98, 74% rate classification.

Paper Reference: (SCI-2-1) 1570225219

Title: Torque calibration with hysteresis brakes

Author(s): Karsten Donat (Germany)

Abstract – Starting from static reference values an accurate torque measuring is achieved by hysteresis correction with splines. To generate a constant torque hysteresis brakes are used. By doing this the real device under test can be simulated in the second step of refeeding to national standards.

Paper Reference: (SCI-2-2) 1570233068

Title: Online cellphone battery entropy measurement for SoH estimation

Author(s): Angel Cuadras, Florian Meinert, Paul Büschel and Olfa Kanoun (Spain-Germany)

Abstract – The widespread use of batteries requires knowledge of their state of health (SoH). In this paper we present a method to use entropy evolution as an aging indicator for batteries. Voltage, current and temperature are monitored in battery cells used in cellphones and in real-time operation. Irreversible entropy is estimated from irreversible energy dissipation in the battery

for long periods of use. Simple open circuit battery voltage U_{ocv} models were evaluated and compared to lab measured U_{ocv} . It was found that the entropy generation rate is always increasing during battery operation and that irreversible entropy is a fingerprint of aging for batteries.

Paper Reference: (SCI-2-3) 1570233482

Title: A Method for mast motion tracking using inertial sensors

Author(s): Nazim Ouadahi, Amina Ababou and Nouredine Ababou (Algeria)

Abstract – In windsurfing, pumping is a reference technique for improving sailing performances and speed. This technique depends on both navigation and athlete physical conditions. For coaches and athletes, the masthead trajectory during pumping is a good indicator to identify the technique being used. In this way, a method based on geometric model used in robotics is proposed to track masthead position using inertial sensors. The proposed mathematical model was validated by simulation; To study the performance of the proposed inertial-based tracking system, preliminary measurements have been carried indoor on a commercial mast foot. The accuracy of the angles deduced from the inertial sensors measurements was investigated by comparison between the mast foot coordinates obtained from inertial sensors' data and from a commercial video- based tracking system taken as reference. A maximum mean error below 108%, has been found and the recreated top mast foot trajectory from inertial sensors showed a good similarity with that obtained from the video-based tracking system.

Paper Reference: (SCI-2-4) 1570235966

Title: HRV-Based Operator Fatigue Analysis and Classification Using Wearable Sensors

Author(s): Hilal Al-Libawy, Ali Al-Ataby, Waleed Al-Nuaimy and Majid A. Al-Taee (United Kingdom)

Abstract – Fatigue assessment and quantification are essential requirements to reduce the risks that occur as a consequence of a fatigued operator. The new wearable device technology offers an accurate measuring ability to one or more of fatigue-related biological data, which helps in quantifying fatigue levels in real-life environments. This paper presents a new heart rate variability (HRV) based operator-fatigue analysis and classification method using low-cost wearable devices. HRV that is considered a robust fatigue metric is measured by several wearable devices including a chest-strap heart monitor and a wrist watch that measures heart rate, skin temperature and skin conductivity. The data collected from real subjects are used to create a training dataset for fatigue analysis and classification. Two supervised machine-learning algorithms based on multi-layer neural network and support vector machine are developed and implemented to identify the alertness/fatigue states of the operator. Performance of the developed classifiers demonstrated high alertness/fatigue prediction accuracy. Such findings proved that the proposed analysis and classification method is valid and practically applicable.

Paper Reference: (SCI-2-5) 1570244213

Title: A low cost signal acquisition board design for Myopathy's EMG database construction

Author(s): Rim Barioul, Sameh Fakhfakh Ghribi and Olfa Kanoun (Tunisia-Germany)

Abstract – In the aims of inventing a new method of myopathy's EMG signals classification, diagnostic and treatment the first step is the creation of an EMG database. The raw EMG signals are rich in information but they have to be amplified, converted to a digital form and filtered to be useful in the diagnostic of myopathy. So, to create an EMG database a low cost and high performance acquisition board is designed. An instrumentation amplifier AD524, an Arduino board(to have a real time analogical to digital conversion) and a Wavelet based filter processed on Matlab software were used to obtain an exploitable EMG database.The correctness of stored signals is evaluated by comparing them with themselves when they were stored on computer using a digital scope(metrix OX6062-II).An SNR metric of 74 dB is calculated, this SNR value is not sufficient to decide of the high performance of the acquisition board.Thus a turn back to compare the representation of a square signal obtained either with the designed board and with the digital scope was done.a calculation of some signal's parameters as period and amplitude shows that the new acquisition board reproduce the input signal shown directly on the screen of the digital scope more closely than that reproduced with the scope's data file.

Paper Reference: (SCI-3-1) 1570227573

Title: Voltage-Mode CMOS Temperature Sensor for Self-Refresh Control in DRAM Memory Cell

Author(s): Nam-Soo Kim, Jusang Park, Sehyuk An and Junho Yu (Korea)

Abstract – This paper proposes a low power CMOS smart temperature sensor which is composed of temperature-to-current generator (TCG), analog-to-digital converter (ADC), and frequency selector. The multiple-block system is to obtain the self-refresh operation for a low power memory cell. The current references and cascode structure are applied in TCG. In frequency selector, oscillator and frequency divider are used to obtain 10 output signals through decoder. The small-size voltage-mode temperature sensor is designed with 0.35- μm CMOS process. Ten different digital outputs are obtained for the temperature ranges of $-30 \sim 80$ C. Simulation test shows that the proposed temperature sensor is operated with power dissipation of 8.28 milli-Watt per sample.

Paper Reference: (SCI-3-2) 1570233285

Title: Type-2 Digital Input and Output Signal Conditioning Circuits for Industrial Safety Applications

Author(s): Omar Gorgies and Leonhard Reindl (Germany)

Abstract – In industrial safety-critical applications, 24V digital line signals are often used, for example: Motor control, hydraulic/pneumatic valve control, and device control [1]. In this paper we present an input and output signal conditioning circuits ($24\text{V} \rightarrow 3\text{V}$, $3\text{V} \rightarrow 24\text{V}$) which have specifications

compatible to Type-2 of the IEC61131 standard [1], including test-signals and status-feedback for circuit monitoring. The failure mode and effect analysis have been calculated and the results shows a probability of failure per hour (PFH) values of for the input circuit and for the output circuit, which can be used to achieve Safety Integrity Level 4 (SIL4). The test signals should be applied by the microcontroller or the control unit to the circuits periodically every 100ms, read the feed back signal, and compared it with the expected value. A safe condition should be implemented in case of detected fault (ex. stopping the machine, sending an alarm signal, or sending an error signal to the main station).

Paper Reference: (SCI-3-3) 1570233320

Title: An UWB Pulse Generator Using Switching CMOS Active Inductor Oscillator

Author(s): Mounir Samet, Dalenda Bissa and Abdennaceur Kachouri (Tunisia)

Abstract – A novel design of an Ultra Wide Band (UWB) pulse generator is presented. This topology is based on the switching of a CMOS active inductor oscillator. With the agreement of the desired specifications, the design technique of UWB pulse generator is described in this work. The achieved simulated results show the best performances of the proposed UWB pulse generator in terms of power consumption (22.6mW at 1.8V voltage supply), frequency bandwidth (530MHz), power spectral density (PSD) which is limited to -43.1dBm/MHz and the best agreement in Federal Communication Commission (FCC). This UWB pulse generator is implemented in a 0.18 μm CMOS process technology.

Paper Reference: (SCI-3-4) 1570233414

Title: Vibration Error Compensation for Mobile Vehicle using Strap-down Inertial Navigation System

Author(s): Hai Yang, Rui Zhang, Fabian Höfninger, Wei Li and Leonhard Reindl (Germany–China)

Abstract – When measuring the position and orientation of some special kind of mobile vehicles, such as agricultural machinery, mining equipment by using the Strap-down Inertial Navigation System (SINS), the performance accuracy of the SINS will be heavily affected by the vibration errors generated from the vehicles. This paper presents a new methodology to compensate vibration error of a mobile vehicle by using a SINS. The method is based on a newly derived coning/sculling error models according to the vibration form of the mobile vehicle. Firstly, coning/sculling error models were derived by modeling the angular vibration and linear vibration of the mobile vehicle as sines and cosines signal. Then, SINS vibration error was compensated by using the model based three-sample and four-sample algorithms respectively. During the experiment, a SINS was mounted on agricultural machinery which is used to fertilize fields. The experimental results indicated that the resulted vibration error such as the coning error and sculling error by using four-sample algorithm is 29.8% and 28.3% lower than the errors by using three-sample algorithm. Nevertheless, both algorithms are able to significantly decrease the

vibration error (64.5% and 74.7% less coning error and 37.5% and 69.6% less sculling error than without compensation) of agricultural machinery by using SINS.

Paper Reference: (SCI-3-5) 1570242611

Title: New PLL architecture based on Sample and Hold Phase Detector

Author(s): Nouri Masmoudi (Tunisia)

Abstract – This paper describes a new design approach of PLL architecture based on Sample and Hold Phase Detector (SHPD PLL). This architecture is a simplification and amelioration of the Inverse Sine Phase Detector (ISPD) PLL [1] [4]. The main difference between the two architectures, that we removed the Inverse Sine function in ISPD model, and replace it by an automatic gain control, which gives PLL more adaptation, stability, wide frequency range and fast response ability. Compared to ISPD PLL, the proposed SHPD PLL is 14 times faster, more stable and 1.7 times frequency range wider than the ISPD PLL.

Paper Reference: (SCI-3-6) 1570233354

Title: New voltage mode bandpass shadow filter

Author(s): Muhammad Taher Abuelma'atti and Nayef Al-Mutairi (Saudi Arabia)

Abstract – A new voltage-mode bandpass shadow filter is presented. The filter is built around the current-feedback operational-amplifier. The parameters of the filter can be controlled by adjusting the gains of external amplifiers built around the current-feedback operational-amplifier. Contrary to the conjecture based on the current-mode shadow filter realization where a summing junction must be used, no summing amplifiers are used in this voltage-mode realization. Experimental results obtained using the AD844 current-feedback operational-amplifier are presented. The results obtained confirm the functionality of the proposed circuit.

Paper Reference: (SCI-4-1) 1570233102

Title: Relative localisation of passive UHF-tags by phase tracking

Author(s): Marten Wegener, Daniel Fross, Marko Rössler, Chris Drechsler, Christian Pätz and Ulrich Heinkel (Germany)

Abstract – In this paper a solution is presented that realise the detection of order of moving UHF-RFID (Ultra High Frequency - Radio Frequency Identification) Tags. Besides pure in-field detection of tags, further information corresponding to the physical distance between tag and interrogator such as signal strength or timing information can be evaluated. The method used in this work exploits phase values together with time stamps. In this way the reader behave like a multi sensor platform. To solve the system inherent problem of ambiguities caused by phase wrapping Kalman Filters are used recovering the unwrapped phase for every tag. Based on this information the algorithm then retrieves the tag locations incorporating knowledge about the principle arrangement and movement of the tags. To validate the robustness

of our approach various test series with an industrial ready reader have been performed also discussing the limits of the given approach.

Paper Reference: (SCI-4-2) 1570235771

Title: Transmitter Power Influence in a Wireless-Signal-Based System Used to Monitor Catalyst States

Author(s): Iurii Motroniuk, Ralf Stöber and Gerhard Fischerauer (Germany)

Abstract – We have recently proposed a stochastic microwave-based measurement approach for the loading state of the catalysts used in automotive aftertreatment systems. In this approach, the interior of the catalyst housing acts as a wireless channel between two end devices of a communications system. It was shown that, depending on the transmission channel characteristics, the properties of the catalyst such as its state can be inferred from the properties of some random function such as the received time response (a random function of time) or its Fourier transform, the received spectrum (a random function of frequency). This publication presents results on the resolution of the measurement method when the normalized cross-correlation function between the received spectra with respectively unloaded and loaded catalyst is used as random function. In particular, we have investigated the influence of the transmit signal power. Measurements and signal evaluation were performed for diesel particulate filter (DPF) with different soot loads probed with an ultra wideband (UWB) system and subsequent processing of the waveform in the frequency domain.

Paper Reference: (SCI-4-3) 1570235773

Title: Indoor Localization System based on Wake-Up Receiver

Author(s): Aymen Marzouki, Sadok Bdiri and Faouzi Derbel (Germany)

Abstract – Energy-Efficient Communication is one of the main requirements in the development of wireless sensor networks. As an alternative technology, Wake-up Receiver (WuRx) systems present a promising energy-efficient network operation, where target devices are only activated in an "on-demand" fashion by means of a special RF signal [1]. This Indoor Localization system aims to accurately estimate the position of the target objects in a closed environment such as a warehouse or in any building and to extend the system's lifetime by reducing the energy consumption. Thus, an operator from a control room can quickly and easily locate carts, appliances, packets etc. This solution enables the localization of the device without having to search everywhere which is very cost effective in terms of speed. For a different scenario, it also allows monitoring of mobile targets, basically for tracking and surveillance applications. Used technology is "Wireless Sensor Networks", we have built our network using panStamp NRG modules for sending and receiving wireless packets through the 868Mhz RF band mounted with WuRx. These modules are equipped with a CC430F5137 MCU (MSP430 core + CC11XX Radio SoC) from Texas Instruments. They can be programmed with Arduino IDE [2].

Paper Reference: (SCI-4-4) 1570233371

Title: Diagnostics Using Self-Sufficient Wireless Sensor Network For a Condition-Based Maintenance Strategy

Author(s): Maik Wolf, Julian Hofbauer and Mathias Rudolph (Germany)

Abstract – Currently in the Leipziger Verkehrsbetriebe (LVB) a tram bearing is replaced only if elaborate inspection finds it faulty. The tram thereby is out of service for several days. To reduce maintenance costs this paper gives a review about investigations how to estimate the wear via wireless and self-sufficient sensors. Moreover, information about the requirements of such sensors are given.

Paper Reference: (SCI-4-5) 1570250378

Title: Energy Efficient Environmental Routing for Fluid System based on Image Detection

Author(s): Daniel Reissner and Wolfram Hardt (Germany)

Abstract – Depending on changing environmental conditions (temperature, humidity, process rates) different amount of fluids like water have to be provided to target (plants, tanks). Problem with delivery of sensor information is typically to high amount of to transfer data by fluctuating sensing or to low transfer rate by static sending module off times, while static preconfiguration is by environmental conditions not known or too much dynamic update effort. Therefor in this paper a reporting preference mechanism is introduced to calculate sending time based on observation of standard behaviour in a self-organized way. Focused scenario is thereby transfer of watering command from distributed humidity sensors.

Paper Reference: (SCI-5-1) 1570233387

Title: Self-sufficient Sensors Based on Energy Harvesting

Author(s): Julian Hofbauer, Maik Wolf and Mathias Rudolph (Germany)

Abstract – Wireless sensors enable fast and easy recording of measurement data - also known as plug and play. Currently a very big challenge is providing of a stable long range power supply. The use of energy harvesting provides an opportunity to supply wireless sensors and to improve the stability of the sensor networks. To estimate the lifetime of sensors (in a network) a simulation tool based on MATLAB/Simulink was developed.

Paper Reference: (SCI-5-2) 1570233450

Title: High Efficiency Modified Rectifier Circuit for Low RF Power Range

Author(s): Issam Chaour, Sadok Bdiri, Ahmed Fakhfakh Olfa and Kounoun (Germany–Tunisia)

Abstract – In this work, a passive rectifier circuit is presented, which is operating at 868 MHz. It allows energy harvesting from low power RF waves with a high efficiency. It consists of a novel multiplier circuit design and high quality components to reduce parasitic effects, losses and reaches a low startup voltage. Using lower capacitor rises up the switching speed of the whole circuit. An inductor L serves to store energy in a magnetic field during the negative cycle wave and returns it during the positive one. A low pass filter is arranged

in cascade with the rectifier circuit to reduce ripple at high frequencies and to get a stable DC signal. A 50 k Ω load is added at the output to measure the output power and to visualize the behavior of the whole circuit. Simulation results show an outstanding potential of this RF-DC converter which has a relative high sensitivity beginning with -40 dBm.

Paper Reference: (SCI-5-3) 1570235839

Title: Energy Saving/Accuracy Tradeoffs for Leak Localization in WSN-based Monitoring of Water Pipelines

Author(s): Muhammad Mysorewala (Saudi Arabia)

Abstract – One of the crucial and challenging issue with the use of Wireless Sensor Network (WSN) for monitoring pipelines, detecting and locating leaks is that of energy saving. With the use of real-time acquisition using heterogeneous sensors, communication and in-network processing, a great level of accuracy in the results can be achieved, but may involve huge energy consumption. In this work, the idea of exploiting 3 different approaches for energy conservation in WSN is presented for water pipelines monitoring namely schemes based on Duty-Cycling and Data-Driven approaches for energy saving, and Least Squares Estimation are presented for reducing communication, sensing and processing energies, when noisy pressure sensors along a straight pipeline are used for finding the location of a leak. Simulation results are shown for localization of small and large leaks for different numbers of sensors that result in various levels of accuracies and energy consumption, which shed some light on the tradeoff that can be achieved in saving energy and attaining good accuracy.

Paper Reference: (SCI-5-4) 1570233486

Title: An 868 MHz Sub-microsecond Steady Low-noise Amplifier

Author(s): Sadok Bdiri and Faouzi Derbel (Germany)

Abstract – The design of a cascaded low-noise amplifier (LNA) for radio receivers is presented. The LNA emphasise a total power gain of 32 dB and depleting an active total current of 2 mA @ 2.5 V. The input return loss S11= -21 dB at 868 MHz with a corresponding noise figure of 0.6 dB. This LNA exhibits a third order intermodulation input intercept point of -21 dBm. To enable the operation within an on-time of 200 ns the LNA is able to settle in less than 50 ns. The LNA is designed for Wake-Up receivers applications. It's fabricated using discrete elements. SiGe transistor technology is adopted.

Paper Reference: (SCI-5-5) 1570232343

Title: Analysis and Optimization of Power Integrity Issues From High Speed CMOS Integrated Circuit Interact

Author(s): Belahrach Hassan (Morocco)

Abstract – The power distribution network (PDN) is constituted by interconnection networks that connect voltage regulator module (VRM) through the printed circuit board (PCB) followed by the packaging paths until integrated circuit. The PDN of an electronic system can increase the noise due to the internal activity of the circuit. In fact, the miniaturization of the device can

transmit the power supply noise to the integrated circuit and superposed with the useful signals. What affects the power and signal integrity. These phenomena reduce the operating speed and reliability of the circuit. In this paper we explore a method for calculating the simultaneous switching noise (SSN) in a PDN, based on the approximation of the frequency domain impedance of PDN by rational functions and the vector fitting method. The simulation results in this paper are verified by Matlab and Pspice tools.

Paper Reference: (MiNE-1-1) 1570233418

Title: Development of an image-processing architecture of a new visual prosthesis

Author(s): Hanen Ben Ayed and Mohamed Masmoudi (Tunisia)

Abstract – This article presents a new design of the visual prosthesis based on the optical stimulation. The aim of this work is to seek an architecture of image acquisition, by using a simple treatment and without recourse to extensive treatment of a processor, and to provide an outlook on the image quality acquired by the patient. To do so, we have proposed two architectures of image processing, which have tested with different images. Simulation results demonstrate that the patient can recognize objects and the projection of targets, read letters (scale 20/200 and 20/100) and identify faces and scenes.

Paper Reference: (MiNE-1-2) 1570234921

Title: Electroosmotic Micropump Analysis for Lab On Chip Water Quality Monitoring

Author(s): Kamel Besbes and Nader Gallah (Tunisia)

Abstract – In this work, a novel design of Electroosmotic micropump with low voltage for Lab on a Chip application is proposed and investigated using theoretical analysis and numerical simulations. The micropump is equipped with four microelectrodes which are embedded at the surface with 45° inclination nearby the inlet and outlet. Some microchannels are implanted through the micropump in purpose to attend a reasonable flow rate for Lab on a Chip application with low voltage. Theoretical analysis and numerical simulations are performed to predict the flow rate of the micropump and the microchannels effect on pumping efficiency. The effect of various microchannels dimension on the performance of the micropump in term of width and length is investigated. Good agreement is shown between the model results and simulations.

Paper Reference: (MiNE-1-3) 1570235928

Title: Embedded approach for edge recognition Case study: Vehicle registration plate recognition

Author(s): Safa Issaoui, Tarek Frikha and Mohamed Abid (Tunisia)

Abstract – The development of multimedia embedded applications continues to increase. As an example, image recognition applications are not only developed for the PCs but also for the embedded systems such as the face recognition, the texture detection and the edge detection. In this paper, we will present a hardware architecture based on an adaptation approach. To validate this architecture, an edge detection approach is chosen. To illustrate

the proposed approach, vehicle registration plate recognition is proposed. The latter application was tested in a first time by a software implementation and in a second time with a mixed Hardware Software architecture on a Xilinx ML 507 FPGA platform.

Paper Reference: (MiNE-1-4) 1570237973

Title: Review on Organic solar cells

Author(s): Asma Khalil and Farid Touati (Qatar-Tunisia)

Abstract – The serious threat of global warming on earth made it necessary to look for alternative sources of energy. In fact, the seek for clean and cheap energy is subject of several research investigations nowadays, and the invention of solar cells was one of the breakthrough towards clean energy alternatives. Unfortunately, the solar cells dominating the market are all made of inorganic materials requiring expensive and complicated manufacturing processes and have limited applications basically to the rooftops. One of the promising alternatives to inorganic solar cells is the organic ones. In this paper, a thorough review on the organic solar cells is elaborated.

Paper Reference: (MiNE-1-5) 1570248563

Title: A New Capacitor-less LED Drive

Author(s): Munir Ahmed Al-Absi, Zainulabideen J. Khalifa and Alaa Hussein (Saudi Arabia-Lebanon)

Abstract – In this paper a new capacitor-less LED drive is proposed. The design is based on the utilization of the internal capacitance of the LED to replace the smoothing capacitor. LED lighting systems usually have many LEDs for better illumination that can reach multiple tens of LEDs. Such configuration can be utilized to enlarge the total internal capacitance and hence minimize the output ripple. Also, the switching frequency is selected such that minimum ripple appears at the output. The functionality of the proposed design is confirmed experimentally and the efficiency of the drive is 85

Paper Reference: (MiNE-2-1) 1570233358

Title: PMMA-enhancement of the lateral growth of transfer-free in situ CCVD grown graphene

Author(s): Dennis Noll and Udo Schwalke (Germany)

Abstract – In this paper we demonstrate the enhancement of the lateral growth of in situ grown catalytic CVD graphene by the introduction of an additional solid carbon source. The fabricated field effect devices show few-layer graphene behavior with an $I_{on}/I_{off} \simeq 5$, up to a nominal channel length $L_{nom} = 10\mu\text{m}$. The prolonged growth of graphene enables the direct growth of larger devices. Furthermore sheet resistivity measurements using a modified greek cross structure are reported, extracting a sheet resistivity of PMMA-enhanced in situ grown graphene of $R_s \simeq 58 \text{ k}\Omega$.

Paper Reference: (MiNE-2-2) 1570233367

Title: Fault Coverage Analysis of Selection Circuit based BIST for RF CP-

PLL

Author(s): Rim Ayadi and Mohamed Masmoudi (Tunisia)

Abstract – Analog and mixed-signal testing is becoming an important issue that affects both the time-to-market and the product cost of many SoCs. In order to provide an efficient testing method for 865–870 MHz Charge pump phase-locked loop (CP-PLL) which constitutes a mixed-signal circuit a novel BIST method is developed. This BIST can be easily implemented with a test stimulus generator circuit, all existing blocks in CP-PLL and fault evaluation circuit. In order to reduce the chip area overhead, this technique uses a selection circuit and one delay cell. The simulation results of the novel technique show high fault coverage 100% like that of our previous testing methods. Thus, it provides an efficient structural test suitable for a production test in terms of an area overhead, a test accessibility, and test time.

Paper Reference: (MiNE-2-3) 1570233443

Title: Design and Electro-Thermal Analysis of a Platinum Micro Heater for Gas Sensors

Author(s): Souhir Bedoui, Sami Gomri and Hekmet Samet and Abdennaceur Kachouri (Tunisia)

Abstract – Micro Hotplate (MHP) is the key component in micro-sensors particularly gas sensors. In this paper, we have presented the design and simulation results of a meander micro heater based on platinum material. A comparative study by simulating two different heater thicknesses has also been presented in this paper. The membrane size is $1.4\text{mm} \times 1.6\text{mm}$ and a thickness of $1.4\mu\text{m}$. Above the membrane, a platinum film was deposited with a size of $1.1 \times 1.1\text{mm}$ and a various thickness of $0.1\mu\text{m}$ and $0.15\mu\text{m}$. Power consumption and temperature distribution were determined in the Platinum micro heater's structure over a supply voltage of 2, 2.5 and 3 V.

Paper Reference: (MiNE-2-4) 1570234964

Title: A 3-5 GHz Fully Differential Power Amplifier for Low Power Medical Applications

Author(s): Amel Neifar, Ghazi Bouzid and Mohamed Masmoudi (Tunisia)

Abstract – This paper presents the design of a CMOS UWB power amplifier operating in the 3–5 GHz frequency range. The proposed circuit is based on a fully differential topology performing in AB-class to achieve a better linearity and using a bandpass filter network with a shunt feedback technique to obtain wideband matching and flat gain. The design was performed using $0.18\mu\text{m}$ technology and simulation results showed a flat power gain of $15.5 \pm 0.4\text{dB}$ across 3–5 GHz band frequency, good input and output return losses with S_{11} and S_{22} below -13dB both and excellent phase linearity with a group delay of 18.4 ps while consuming only 25.46 mW from 1.8 V dc supply.

Paper Reference: (MiNE-2-5) 1570236001

Title: A new programmable ALU architecture for hard-core processor

Author(s): Hajer Najjar, Riad Bourguiba and Jaouhar Mouine (Tunisia–Saudi Arabia)

Abstract – Hard-core processors are known to be a very performed in terms of operation frequency, area and power consumption. However, they have fixed design so that they cannot be reused for different applications. In this paper we propose a new ALU (Arithmetic and Logic Unit) architecture that allows to these processors to be generic propose without losing hard-core performances.

Paper Reference: (MiNE-3-1) 1570233480

Title: Reconfigurable circuits design based on DG-CNTFET transistors

Author(s): Houda Ghabri, D. Bissa and Hekmet Samet (Tunisia)

Abstract – Transistors with controllable-polarity have an interesting property, they can switch from p - to n -type behavior and vice versa dynamically. This opens up the opportunity for novel reconfigurable design and we can build complex functions in fine-grain reconfigurable logic inaccessible to MOS-FETs. Double-gate carbon nanotube field effect transistors (DG-CNTFETs) is one of promised candidate for reconfigurable circuit Promising performance levels for novel device. Based on a compact physical model of these transistor, we demonstrate the benefit of designing a reconfigurable circuit. In this paper, an overview of different types of carbon nanotube field-effect transistor (CNTFET) is given. DG-CNTFET model is described and simulated. Also a dynamically reconfigurable 8-function logic gate (CNT-DR8F) based on a (DG-CNTFET) is described, simulated and analyzed.

Paper Reference: (MiNE-3-2) 1570234594

Title: Electrically Reconfigurable Dual Metal-Gate Planar Field-Effect Transistor for Dopant-free CMOS

Author(s): Tillmann Krauss, Frank Wessely and Udo Schwalke (Germany)

Abstract – In this paper, we demonstrate by simulation the feasibility of electrostatically doped and therefore reconfigurable planar field-effect-transistor (FET) structure which is based on our already fabricated and published Si-nanowire (SiNW) devices. The technological cornerstones for this dual-gated general purpose FET contain Schottky S/D junctions on a silicon-on-insulator (SOI) substrate. The transistor type, i.e. n -type or p -type FET, is electrically selectable on the fly by applying an appropriate control-gate voltage which significantly increases the versatility and flexibility in the design of digital integrated circuits.

Paper Reference: (MiNE-3-3) 1570235183

Title: On/Off Wide Tuning Range Voltage Controlled Ring Oscillator for UWB Pulse Generator

Author(s): Imen Barraaj, Amel Neifar, Hatem Trabelsi and Mohamed Mas-moudi (Tunisia)

Abstract – This paper presents an on/off switched wideband three-stage voltage controlled ring oscillator for multiband ultra-wideband (UWB) systems. The ring oscillator is a part of UWB pulse generator, thus its oscillating frequency determines the central frequency of the pulse spectrum and has significant effect on spectrum fitting within UWB FCC mask. The oscillator has two control inputs, one for band switching and one for continuous control of

the output frequency. The circuit was designed using ST 65nm CMOS process. Simulated data shows a very wide tuning range, approximately from 2.5GHz to 7GHz that the designed oscillator is suitable for ultra-wideband system applications. The phase noises at 1MHz and 10MHz offset are -89.2 dBc/Hz and -113.4 dBc/Hz, respectively.

Paper Reference: (MiNE-3-4) 1570245849

Title: Virtual Channel NoC Architecture with adaptive inter-channel buffers sharing

Author(s): Manel Langar, Riad Bourguiba and Jaouhar Mouine (Tunisia-Saudi Arabia)

Abstract – Network on chip is the new efficient interconnection structure of nowadays complex system on chips. The performance of NoC in terms of latency, throughput and power consumption should be optimized. Since buffers consume around 60% area and 30% power of the whole router, the relationship between network performance and memory resources has to be considered. In this paper, we propose a new router architecture enabling an adaptive virtual channels sharing among different input ports. This router solves the problem of virtual channels under utilization; it improves the area and power consumption performance without affecting the latency.

Paper Reference: (MiNE-3-5) 1570248567

Title: A New Compact CMOS C-Multiplier

Author(s): Munir Ahmed Al-Absi and Eyas Al-Suhaibani (Saudi Arabia)

Abstract – This paper presents a new compact CMOS capacitance multiplier. The multiplier is based on using the translinear principle. Only four MOS-FETs operating in subthreshold region are used. The multiplication factor is controllable to meet the designer requirements. Tanner TSPICE simulator is used to confirm the functionality of the design in 0.18 μ m CMOS Technology. The circuit operates from ± 0.75 supply voltage. Simulation results indicate that the multiplication factor is large compared to existing designs. The functionality of the proposed capacitance multiplier is demonstrated by using it in designing relaxation oscillator.

Author index

A

Ababou, A.	42
Ababou, N.	42
Abdelhedi Bouaziz, F.	15, 16
Abdelkrim, M. N.	23
Abdelmoula, M.	26
Abid, A.	7, 8
Abid, M.	49
Abouheaf, M.	16, 26
Abuelma'atti, M. T.	45
Agha, A.	20
Aguir, K.	41
Ahmad, Z.	50
Al-Absi, M. A.	50
Al-Ataby, A.	42
Al-Dhaifallah, M.	12
Al-Habaibeh, A.	3
Al-Khawaldeh, A.	11
Al-Libawy, H.	42
Al-Mutairi, N.	45
Al-Nuaimy, W.	42
Al-Qutub, A.	14
Al-Saif, A.	10, 14
Al-Taee, H. A.	42
Al Faoury, A.	17, 20
AL Hammad, Y.	18
Al Owaifeer, M.	23
Ali, M. M.	11
AlMuhaini, M.	23, 24, 24, 24
An, S.	43
Aoun, M.	9, 10, 10
Arrichiello, F.	2
Awwad, M. A.	1
Ayadi, M.	18
Ayadi, R.	51

B

Büschel, P.	41
Bacha, A.	8
Banat, I.	24
Bani Younis, M.	6

Barioul, R.	43
Barraj, I.	52
Bdiri, S.	46, 47, 48
Bedoui, S.	51
Bel Haj Frej, G.	10
Belahrach, H.	48
Belazzoug, M.	17
Belkheiri, M.	19
Ben Ayed, H.	49
Ben Ayed, R.	19
Ben Jemaa, S.	11
Ben Kilani, K.	20, 20
Ben Salem, F.	18, 19, 25
Bensalem, Y.	23
Besbes, K.	49
Besbes, M.	15
Bhatia, S.	39
Biesenbach, R.	6
Bissa, D.	44, 52
Bouchoucha, C.	20
Boudour, M.	17
Boukhari, R.	9
Boukhnifer, M.	9, 9
Bourguiba, R.	51, 53
Boutayeb, M.	10, 10
Bouteraa, Y.	7, 15
Bouzid, G.	51
Bruckner, T.	22

C

Chaibet, A.	9, 9
Chaour, I.	47
Chelly, N.	8
Chtourou, M.	14, 16
Cuadras, A.	41

D

Dakhli, I.	15
Dalhoumi, L.	14
Dariimaa, B.	7
Delmotte, F.	11
Denker, N.	11
Derbel, F.	46, 48

Derbel, N.	6	Hashim, H.	6
..... 7, 8, 15, 16, 18, 19, 23, 25		Heinkel, U.	22, 45
Diallo, D.	9	Helling, T.	40
Djemel, M.	14	Herold, C.	22
Donat, K.	41	Hofbauer, J.	47, 47
Drechsler, C.	22, 45	Houiji, M.	9
<u>E</u>		Huang, C.	15
Elleuch, M.	20, 20	Hussein, A.	50, 24, 24
Elshafei, M.	14	<u>I</u>	
Elshatarat, H. L.	6	Issaoui, S.	49
Ershad, H.	9	<u>J</u>	
<u>F</u>		Jallouli-Khlif, R.	7, 8
Fakhfakh, A.	47	Jlassi, Z.	20
Fakhfakh, S.	43	<u>K</u>	
Faleh, R.	41	Kachouri, A.	41, 44, 51
Fathallah, M.	16	Kahouli, A.	21
Feki, M.	2, 11	Kandlbinder, C.	40
Fertell, R.	9	Kanoun, O.	2, 41, 43, 47
Fischerauer, A.	40	Keitsch, K.	22
Fischerauer, G.	40, 46	Khalifa, Z. J.	50
Fitouri, M.	23	Khalil, A.	50
Fitzek, F.	1	Khan, F. A.	40
Frikha, T.	49	Kim, N.	39, 43
Fross, D.	45	Kim, Y.	39
<u>G</u>		Knoll, C.	7, 15
Gallah, N.	49	Krauss, T.	52
Gasmi, N.	10	Krichen, L.	21
Gerstmann, J.	40	Ksantini, M.	11
Ghabri, H.	52	<u>L</u>	
Ghaeb, J.	17	Laamiri, I.	14
Ghozzi, F.	25	Langar, M.	53
Glase, S.	9	Lazim, M.	17
Gomri, S.	41, 51	Leutelt, M.	21
Gorgies, O.	43	Li, W.	44
<u>H</u>		Lindemann, A.	22
Höflinger, F.	39, 44	Loukil, J.	23
Hadj Abdallah, H.	21	<u>M</u>	
Haj Hamida, A.	20	Müller, S.	22
Hamdaoui, R.	9	Maherzi, E.	15
Hammami, M. A.	11	Mahmoud, M. S.	16
Hardt, W.	47	Makki, H.	12

Marzouki, A.	46	Said, B.	19
Masmoudi Loukil, F.	23, 25	Saleem, A.	24
Masmoudi, M. ..	49, 50, 51, 51, 52	Samet, H.	51, 52
Masmoudi, N.	45	Samet, M.	44
Mehdi Ali, M.	6, 7	Sbita, L.	25
Meinert, F.	41	Schrödel, F.	11
Mekki, N.	21	Schwalke, U.	50, 52
Melchior, P.	7, 8	Siegl, M.	40
Messaoud, H.	14	Siwe, A. T.	13, 13, 13
Michel, B. G.	26	Stöber, R.	46
Motroniuk, I.	46	Strauss, B.	22
Moughamir, S.	26	T	
Mouine, J.	51, 53	Tembine, H.	13, 13, 13
Mysorewala, M.	48	Thümmler, M.	12
N		Thabet, A.	10, 10
Nacef, I.	20	Touati, F.	50
Nahas, N.	26	Trabelsi, H.	52
Najjar, H.	51	Tutunji, T. A.	18
Neifar, A.	51, 52	V	
Neujahr, S.	12	Vosswinkel, R.	11
Nisar, K. S.	12	W	
Njah, M.	16	Wagah, M.	18
Noll, D.	50	Wegener, M.	45
O		Wessely, F.	52
Othman, M.	41	Wolf, M.	47, 47
Ouadahi, N.	42	Wolff, V.	21
Oudhini, Y.	25	Y	
P		Yang, H.	39, 44
Pätz, C.	45	Younis Ali, T.	7
Park, J.	39, 43	Yu, J.	39, 43
Postolache, O.	3	Z	
Pretschner, A.	12, 21	Zhang, R.	39, 44
R		Ziadi, S.	16
Röbenack, K.	7, 11, 15	Zorig, A.	19
Rabhi, A.	19	Zuerl, T.	40
Raisemche, A.	9	Zukarnain, Z. A.	4
Reindl, L.	39, 43, 44		
Reissner, D.	47		
Richter, H.	11		
Rudolph, M.	47, 47		
S			