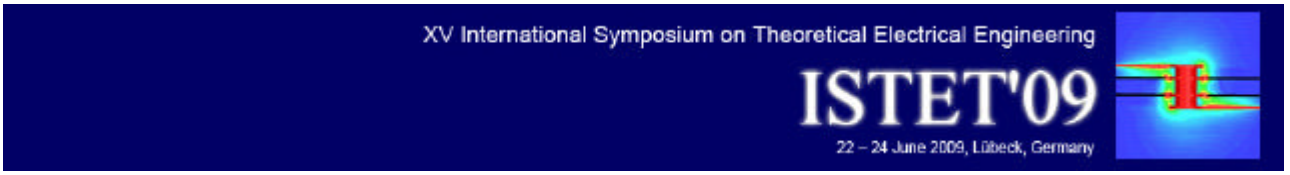

Technical Program

Monday, Jun 22

09:00 - 09:25

G1: Opening session

09:25 - 10:00

T1: Tutorial 1

Miniaturisation of Electrical Machines

Bernd Ponick (Leibniz Universität Hannover, Germany)

Approaches for a miniaturisation of electrical machines that are based on an electromagnetic principle have to overcome numerous challenges. Some of these are only a result of the rules of growth (or shrinkage), some are a result of the micro technological fabrication processes. This paper gives an overview about the current state of the art including various examples of linear and rotating micro actuators that have been realised.

pp. 1-4

10:00 - 10:40

F1: Fields 1

A New Mathematical Approach for Faults Identification and Location in Distribution Systems

Gaetano Zizzo (University of Palermo, Italy); Angelo Campoccia (University of Palermo, Italy); Eleonora Riva Sanseverino (University of Palermo, Italy); Maria Luisa Di Silvestre (University of Palermo, Italy)

The paper presents a new methodology for fault identification and location in electrical distribution systems, based on the use of a lumped parameter representation of the faulted line and on a matrix approach. Utilities are quite interested in such items, since the new required quality standards put severe constraints on faults management and clearance.

pp. 5-9

Full-Wave Transmission Line Theory for Thick Cylindrical Wires

Jürgen Nitsch (Otto-von-Guericke University Magdeburg, Germany); Sergey Tkachenko (Otto von Guericke University Magdeburg, Germany)

The Full Wave Transmission Line Theory (FWTL) describes the propagation of high-frequency signals along conductors in both the modal and global representation. In the present paper we generalize the FWTL for electrically thick wires, when both the axial and azimuthal components of the current have to be taken into account and the proximity effect becomes effective .

pp. 10-14

S1: Systems 1

CSI with Quantizer Selection for Video Coding

Lung-Jen Wang (National PingTung Institute of Commerce, Taiwan); Trieu-Kien Truong (I-Shou University, Taiwan)

In this paper, it is shown that the cubic-spline interpolation (CSI) scheme can be used with quantizer selection to reduce the blocking effects of MPEG-4 decompressed image. Furthermore, the quantizer selection based on the rate-distortion optimization algorithm can generate an adaptive quantization for the CSI scheme. Finally, the proposed algorithm can achieve a better subjective and objective performance than that of the standard MPEG-4 algorithm.

pp. 15-19

The Joint Probability Density Function of the SSC Combiner Output Signal in the Presence of Weibull fading

Petar Nikolic (Tigar Tyres, Pirot, Yugoslavia (defunct)); Mihajlo Stefanovic (Faculty of electronic engineering, Nis, Yugoslavia (defunct)); Dragana Krstic (Faculty of Electronic Engineering, University of Niš, Serbia, Yugoslavia (defunct)); Goran Stamenovic (Tigar, Pirot, Yugoslavia (defunct))

In this paper the probability density function of the Switch and Stay Combining (SSC) combiner output signal at one time instant and the joint probability density function of the SSC combiner output signal at two time instants are determined. SSC combiner with two branches is considered. The presence of the Weibull fading at the input is observed. The results are shown graphically for different values of parameters and decision threshold values

pp. 20-24

10:40 - 11:10

B1: Coffeebreak 1

11:10 - 12:30

F2: Fields 2

Calculation of mutual impedance between buried conductors of finite length

Konstantinos Rallis (University of Western Macedonia, Greece); Theodoros Theodoulidis (University of Western Macedonia, Greece, Greece)

The knowledge of mutual impedance between buried conductors is of great importance in the field of electric energy systems, for studying power transmission and grounding systems behavior, especially during transient phenomena. In the present work we present novel expressions for calculating the mutual impedance between finite length conductors of arbitrary position in a homogeneous earth. The resulting expressions have the form of a double integral which we initially evaluate by adaptive quadratures. We then present a technique that was developed for alternatively calculating these expressions utilizing Sommerfeld integrals and the Discrete Complex Image Method.

pp. 25-29

Physical Interpretation of the Parameters in the Full-Wave Transmission Line Theory

Sergey Tkachenko (Otto von Guericke University Magdeburg, Germany); Juergen Nitsch (Otto-von-Guericke University Magdeburg, Germany)

The Full Wave Transmission Line Theory (FWTL) generalised the classical Transmission Line approximation (TL) for the high frequencies when the accounting of radiation effects is necessary. In the present paper we develop the FWTL for a homogeneous line with two lumped sources, when all calculation can be curried out at the explicit form, and install the connection between the parameters of FWTL and current modes (TEM mode, leaky modes and radiation mode) arising near the line non-uniformities

(lumped sources).
pp. 30-34

Multipole Scattering in Periodic and Random Layers of Metal Helices
Christian Meiners (Plath GmbH, Germany); Arne Jacob (Technische Universität Hamburg-Harburg, Germany)
Scattering in layers composed of periodic and non-periodic arrangements of small metal helices is discussed. Metal helices exhibit a pronounced resonance and are thus very effective scatterers. Scattering is expressed in terms of multipole moments. The investigations show that only few multipole contributions are necessary to model the interaction correctly.
pp. 36-39

S2: Systems 2

Foundations of Network Theory
Albrecht Reibiger (Dresden University of Technology, Germany)
Different axiomatizations of network theory are considered. The emphasis is put on Kirchhoff networks. Following a tradition founded by Kirchhoff the topological structure of these networks is characterized by means of oriented graphs. Alternative variants of axiomatizations are considered where networks are defined as interconnections of multipoles or multiports. A consequent enforcement of the multiport approach leads directly to the class of Paynter networks for which bond graphs deliver an adequate representation.
pp. 40-44

Analysis of transistor circuits having multiple DC solutions with the thermal constraint
Michal Tadeusiewicz (Technical University of Lodz, Poland)
This paper offers a new method for finding all the DC solutions of diode-transistor circuits. It can be directly used to the circuits with constant parameters, when the thermal constraint is ignored or introduced into an earlier developed algorithm enabling us to consider the thermal behaviour of the chip. Numerical experiments show that the proposed approach considerably improves the analysis.
pp. 45-48

A nonlinear statespace model for PLLs and a comparison between PLLs and the entrainment effect
Oliver Scharf (Leibniz University of Hannover, Germany); Olaf Schnick (Leibniz University of Hannover, Germany); Wolfgang Mathis (Universität Hannover, Germany)
In this paper a nonlinear description of PLLs is given. Its validity is shown through the comparison with a simple experimental setup. This holds true for all areas of operation, even far away from the locking range. Furthermore a comparison between the dynamic behaviour of PLLs and the entrainment effect is given.
pp. 49-52

Dictionary Method for Multiple Soft Fault Diagnosis in Analog Circuits with Handling Tolerances
Marek Korzybski (Technical University of Lodz, Poland)
The paper deals with the multiple soft fault diagnosis in analog circuits. The dictionary method for detection, location and identification of multilpe soft fault has been presented in [1]. It is based on the node approach and one of the new evolutionary method – gene expression programming. In this paper the developing of the method with handling tolerances is presented. The proposed approach with taking into account tolerances is based on Monte Carlo analysis of circuit under test with different values of elements which are not faulty and also have not nominal values. The method is illustrated with numerical examples.
pp. 53-56

12:30 - 13:30

B2: Lunchbreak 1

13:30 - 14:30

P1: Poster 1

Proportional-Integral-Derivative position control of variable reluctance stepper motor
Jakub Kolota (Poznan University of Technology, Poland)
The problem of accurate positioning of variable reluctance stepper motor is considered. On the basis of a non-linear distributed parameters model, a PID controller is designed that guarantees execution of a desired angle displacement, feeding back rotor position signal. Simulations compare the performance of the step response signals including main of the quality indexes in time domain. Applying a high voltage to the winding until acceptable current is reached and then dropping the voltage to a level that will maintain maximum current value can be efficient way to improve the performance of a stepping motor.
pp. 57-60

Assessment of transient disturbances in HV systems with single-phase autoreclosures
Peter Schegner (Dresden University of Technology, Germany); Tadeusz Lobos (Technische Universitaet Dresden, Germany); Tomasz Sikorski (Wroclaw University of Technology, Poland)
This paper proposes some extended method for assessment of transient disturbances in HV system with single-phase autoreclosures. Main efforts are addressed to second arc extinction on the basis of recorded voltage in faulty line in presence of arc. Introduced ideas utilizes recent definitions of time-varying power quality indices. A new contribution of the work is a proposition of characteristic based on local values of odd and even harmonics distortion index.
pp. 61-64

Aperiodic and Quasi-Periodic Signal Identification
Ján Petrilák (Alexander Dubcek University of Trencin, Slovakia); Peter Siroky (Alexander Dubcek University of Trencin, Slovakia); Andrea Siroka (Alexander Dubcek University of Trencin, Slovakia); Dušan Maga (Alexander Dubcek University of Trencin, Slovakia)
The analog signals are usually replaced by digital signal in technical field. This fact requires the new methods for theoretical and practical applications. The solution will be easier in case if digital computer and digital measurement system are cooperating. The main point of this article is aperiodic and quasi-periodic signal identification, based on experiments results.
pp. 65-67

Electromagnetic deduction of the power in electric circuits
Massimo Guarnieri (University of Padua, Italy)
The classical electromagnetic deduction of the power in electric circuits resorts to the Poynting's theorem. However this theorem relies on an assumption regarding the expression of locally stored electromagnetic energy. This assumption allows for alternative expressions of the power required to build the electromagnetic field, which are proposed and exploited in specific analyses. An alternative formulation is presented here based on the Slepian's vector, directly derived form the Maxwell's equations, that fits particularly to circuits, as it provides an easy and straightforward confirmation the power expression through circuit elements.
pp. 68-72

A new approach to ERG/VEP stimulation in colour vision testing
Michal Zaleski (West Pomeranian University of Technology, Poland); Andrzej Brykalski (West Pomeranian University of Technology, Szczecin, Poland); Wojciech Lubinski (Pomeranian Medical University, Poland); Krzysztof Penkala (West Pomeranian University of Technology, Poland)
In the paper a generator and a new kind of stimuli for ERG (Electroretinography) and VEP (Visual Evoked Potentials) colour vision tests are presented. These stimuli are based on colour change with constant luminance (isoluminance). Sample results obtained in laboratory experiments as well as possible applications of this stimulation technique are also discussed.
pp. 73-74

Transverse Flux Motor Coupled with Switched-mode Power Converter
Damijan Miljavec (University of Ljubljana, Slovenia); Mykhaylo Zagirnyak (Kremenchuk State Polytechnic University, Ukraine); Janez Leskovec (Kolektor, Slovenia); Franci Lahajnar (Kolektor, Slovenia); Bostjan Pevec (University of Ljubljana, Slovenia)
The aim of this paper is to present the optimization of outer rotor permanent magnet transverse flux motor (TFM) using design of experiments. The magneto-static finite-element analysis is used to calculate cogging torque regarding variation of TFM geometric parameters. Further, in 3-D time-stepping finite-element analysis the TFM model is coupled with an external switched-mode power converter. The main objectives of TFM geometry optimization are minimization of cogging torque, maximization of mean electromagnetic torque and minimization of current loadings of power converter. All three optimization targets are realized in one TFM prototype. The optimization results are compared with measured ones.
pp. 75-79

On-State Power Dissipation Analysis in Cascaded H-Bridge Staircase Multilevel Inverter
Ehsan Esfandiari (Islamic Azad University, Majlesi Branch, Iran); Norman Mariun (Universiti Putra Malaysia, Malaysia); Mohammad Hamiruce Marhaban (Universiti Putra Malaysia, Malaysia)
In renewable power generators, because of high initial cost of system and high duty cycle of converters, it is important to have ability to calculate the efficiency of inverters exactly. Cascaded H-Bridge Multilevel inverter is one of the most important and efficient inverter structures. In this paper, the on-state power dissipation in Cascaded H-Bridge multilevel inverters for power factors close to one is analysed and efficiency equations are extracted for inverters driven by Mosfets and other p-n junction switches.
pp. 80-84

FPAA Based Dynamically Reconfigurable Filters for Analog Signal Processing

Mariana Jurian (University of Pitesti, Romania); Ioan Lita (University of Pitesti, Romania); Daniel Alexandru Visan (University of Pitesti, Romania); Bogdan Cioc (University of Pitesti, Romania)

This paper approaches the problem of dynamically reconfigurable filters design using the new technology of Field Programmable Analog Arrays (FPAAs). Based on the configurable analog blocks (CABs) system and Anadigm Designeer2 software, an interesting and promising idea to implement the dynamically reconfigurable filters is exposed. The system is practically implemented and verified by using an developing board equipped with an AN231E04 reconfigurable integrated device from Anadigm, and an PIC microcontroller that manage the connection between PC and the FPAA device. The programming of the AN221E04 is realised through a serial connection with the PC.

pp. 85-85

State Equations for Fractional RLC Circuit

Zygmunt Garczarczyk (Silesian University of Technology, Poland)

In the paper, we use some of the fractional calculus techniques , which are applicable to the analysis of linear fractional-order systems. We analyze linear serial RLC circuit described by fractional –order state equation. The Adomian decomposition method for solving RLC state equation in general case is applied .

pp. 86-86

Stability radius of linear interval parameter circuits

Lubomir Kolev (Technical University of Sofia, Bulgaria)

A method for determining the stability radius of linear interval parameter circuits is suggested for the case where the dynamics of the circuit studied is modeled by an interval matrix A. The method is based on a transformation of the original problem into the problem of determining the maximum magnitude eigenvalue of an associated interval generalized eigenvalue problem. It is applicable if certain sufficient, computationally verifiable conditions are satisfied. It is shown that its numerical complexity is polynomial in the size n of the interval matrix involved. Numerical examples illustrating the applicability of the new method are also provided.

pp. 87-91

The Offset of Magnetic Microsensors

George Caruntu (Constanta Maritime University, Romania); Cornel Panait (Constanta Maritime University, Romania)

An essential parameter in the setting up of the performance of the measurement systems that uses Hall microsensors is the magnetic offset of such devices. This paperwork presents the structure, the operating conditions, and the main characteristic for double drain magnetotransistors and for vertical bipolar magnetotransistor. By using numerical simulation, the values of the offset-equivalent magnetic induction for two analysed devices are compared and it is also emphasised the way in which choosing the geometry and the material features allows getting high-performance sensors.

pp. 92-95

The Equivalent Magnetic Induction of Hall Microsensors

Cornel Panait (Constanta Maritime University, Romania); George Caruntu (Constanta Maritime University, Romania)

These The paper presents the result of research work regarding the analysis and optimization of magnetic microsensors realized in MOS integrated circuits technology. On the basis of adequate models these have been established the noise main characteristics for MOS-Hall plates and for double-drain MOSFET magnetotransistors. By using the numerical simulation the values of the mean square noise equivalent magnetic induction for the two analyzed structures are compared and it is also emphasized the way in which choosing the geometry and the material features allows getting high-performance sensors.

pp. 96-99

Extraction of model parameters of the small-signal EKV MOSFET model using Cadence PSpice

Elissaveta Gadjeva (Technical University of Sofia, Bulgaria); Vladislav Durev (Technical University of Sofia, Bulgaria); Marin Hristov (Technical University of Sofia, Bulgaria)

An approach to model parameter extraction of the small-signal EKV MOSFET model using Cadence PSpice is proposed. The extraction is realized using the measured S-parameters as an input data. The approach is useful in RF model design, as the S-parameters can be easily measured for a given microelectronic technology. The obtained results are accurate and in agreement with the measured results.

pp. 100-103

A direct approach to parameter extraction of wide-band on-chip spiral inductor model

Elissaveta Gadjeva (Technical University of Sofia, Bulgaria); Vladislav Durev (Technical University of Sofia, Bulgaria); Marin Hristov (Technical University of Sofia, Bulgaria)

An automated on-chip spiral inductor parameter extraction procedure is developed in the present paper. It is realized in the Cadence PSpice and Cadence Probe environment. A procedure is proposed to introduce the measured two-port S-parameters as input data and to calculate the parameters of the spiral inductor wide-band model. The proposed algorithm shows excellent agreement with the measured data over the whole frequency range

pp. 104-108

Transient and Sensitivity Analysis of Uniform Multiconductor Transmission Lines via FDTD Methods

Lubomir Brancik (Brno University of Technology, Czech Republic)

The paper deals with techniques for a computation of voltage and/or current distributions along the multiconductor transmission line (MTL) wires by means of Finite-Difference Time-Domain (FDTD) methods. Besides the basic methods are extended to enable sensitivities determination useful for gradient-based optimization techniques. All computations are done in the Matlab language environment utilizing sparse matrix notations, comparisons with state-variable and Laplace transform techniques are presented as well.

pp. 109-113

Circuit Fault Diagnosis Based on Wavelet Packet and Neural Network

Andrzej Kuczynski (Technical University of Lodz, Poland); Marek Ossowski (Technical University of Lodz, Poland)

In this paper, neural network algorithms of fault diagnosis for analog circuit are presented. Measurement of dynamic supply current is utilized for detecting the catastrophic faults. A discrete wavelet transform is used as preprocessor in order to reduce the nodes in input layer and hidden layer of BP neural network. The illustrative numerical examples are presented.

pp. 114-117

SANGA II: a New Approach to Niche Radius Identification

Emanuele Dilettoso (University of Catania, Italy); Santi Rizzo (University of Catania, Italy); Nunzio Salerno (University of Catania, Italy)

The Self-Adaptive Niching Genetic Algorithm (SANGA) is an optimization algorithm for multimodal problems able to identify the "niches" of local optima estimating their radii. SANGA is particularly suitable for the optimization of electromagnetic devices, in which the behaviour of the objective function is usually unknown, because it does not need a priori specification of a dissimilarity parameter and uses a relatively low number of objective function evaluations. This paper presents some modifications to the SANGA algorithm in order to improve its ability to estimate the niche radius and its good coupling with the deterministic Pattern Search (PS) method.

pp. 118-121

Some methods for quickly determining the terms of the conductance matrix [G]

Marcello Sylos Labini (Polytechnics of Bari (Italy), Italy)

Some new methods for determining the terms of [G] are given. The first one calculates [G] by means of the inversion of the matrix of the coefficients of the system based on Kirchhoff's laws; the second one determines [G] per columns by an algorithm based on the Gaussian Elimination. The last method finds the new terms G'jj of the circuit under consideration when a branch i of the circuit is removed. The methods have been tested on different circuits and the determination of the terms of [G] is very quick also because of the wellknown symmetry of [G].

pp. 122-126

How to Widen the Field of Application of the Conductance Matrix

Arturo Covitti (Polytechnics of Bari (Italy), Italy)

This paper is focused on the conductance matrix [G] so as to widen its field of application. The origin of this matrix is at first suggested together with the classic methods of determining all the terms of [G]. Then, some new methods to analyze linear circuits are suggested, these methods being based on the knowledge of the matrix [G]. In this way the use of the conductance matrix turns out to be widened.

pp. 127-131

Analysis of Operation of Busbars Section Coupling in Industrial Substations

Olgierd Malyszko (West Pomeranian University of Technology, Poland); Michal Zenczak (West Pomeranian University of Technology, Poland)

Abstract. Typical big industrial substation is supplied by two HV 110 kV lines. Additionally busbars are connected to generators, synchronous mo-tors and induction motors. During short-circuits on busbars currents are flowing from many sources. The short-circuits currents may be higher than short-circuits strength of busbars. In this case operation of coupling of busbar section is very important. These papers contains analysis of function-ing of busbar section coupling in industrial substations.

pp. 132-135

Current-carrying capacity of overhead power transmission lines in different weather conditions

Olgierd Malyszko (West Pomeranian University of Technology, Poland); Michal Zenczak (West Pomeranian University of Technology, Poland)

Very often current-carrying capacity is treated as the constant parameter, at most dependent on season of the year. Presented analysis takes into considerations the current temperature of the air, insolation, wind velocity, humidity and rain. The paper presents the results of calculation for different cases of weather and situations in power system. Above mentioned weather factors create possibility for additional transmission of power by overhead lines.

pp. 136-139

Unconventional PM Synchronous Generators for Wind and Wave Integrated Platform Plants

Valery Chrisanov (West Pomeranian University of Technology, Poland); Sebastian Wiszniewski (West Pomeranian University of Technology, Poland)

The paper describes a new structure of a wind and wave power plant with two groups of electrical machine: multipole axial flux and linear tubular PM synchronous generators. Both type generators are installed on the common platform extended along an offshore aria. A few important issues are reported including the plant power converter topologies for interconnection between generators and interfacing a grid, identification of generators parameters and aspects of design optimisation problems. Variable speed operation of both type generators avoids the necessity of their output values synchronisation and provides the underwater HVDC electrical energy transmission.

pp. 140-144

Spectral analysis of network traffic.

Elena Petrova (Moscow State University, Russia); Anna Petrova (Moscow State University, Russia)

The paper presents a multifractal approach to analysis of traffic flows. The aim of the method is to reduce the complexity of throughput analysis and the number of involved resources. We compare the spectral view of different types of flows to determine the differences and similarities of basis structure and behavior. The paper describes a new approach which allows to describe the state of channels.

pp. 145 -145

14:30 - 15:00

B3: Coffeebreak 2

15:00 - 15:35

T2: Tutorial 2

Clinical Measures in Cochlear Implant Simulations

Jeroen Briaire (Leiden University Medical Center, The Netherlands)

Cochlear implants have become a standard rehabilitation method for hearing impaired patients. Modern implant systems allow for various recordings modalities of current spread and neural responses. Patient recoded current flow data is used to optimise the conductivity parameters of a realistic 3-dimensional model of the implanted human cochlea. Histological data is implemented obtain correct positioning of neural structures. CT- images are used to implement inter- patient variation. The in this way created model is used to analyse newly developed implant designs and speech coding strategies. The model gives insight in stimulation paradigms and has good correlations with psychophysical and objective measurements.

pp. 146 -146

15:35 - 16:55

F3: Fields 3

Multi -Objective Optimization of the Field Distribution for an Electrostimulative Prosthesis

Carsten Potratz (University of Rostock, Germany); Ursula van Rienen (University of Rostock, Germany)

We describe methods for the automatic design optimization of a system of electrodes in a highly inhomogeneous domain to satisfy a set of objective functions. Due to the inherent complexity we use numerical simulations to compute the ?eld distribution within the domain of interest.Furthermore, we present an adapted optimization algorithm applicable to the problem presented here. Finally, we show ? rst optimization results and make general remarks about the optimization process including the topologicalstructure of the ?tness landscape, measures to preserve diversity in the solution set and possible deteriorating effects to the solution candidates due to numerical inaccuracies.

pp. 147 -147

Distributed Optimization Environment for Bioelectromagnetism

Jacek Starzynski (Warsaw University of Technology, Poland); Robert Szmurlo (Warsaw University of Technology, Poland); Bartosz Sawicki (Warsaw University of Technology, Poland)

This paper describes distributed optimization system designed to use hybrid local area network resources to solve computationally expensive inverse problems of bioelectromagnetism. The system consists of numerical core extending the scientific system for evolutionary computations and network communication system build on Java RMI specification. It is portable, effective and relatively inexpensive. Usage of the system is presented on the basis of optimal design of the magnetic stimulator for vagus nerve.

pp. 149 -153

Investigation of Acoustic Resonance Frequencies for a Geometric Model of Thyroid Gland

Gheorghe Gavriloaia (University of Pitesti, Romania)

The thyroid gland, one of the largest endocrine glands, is investigated as a resonant cavity forming a means of storing energy at a particular frequency with a small bandwidth. A number of 16 acoustic frequencies are evaluated for a geometric model of thyroid gland, by using finite element method. The spatial distribution of the extreme values of acoustic pressure is in accordance with blood supplier positions. The decrease of blood supplier efficiency and local temperature is argued when certain objects appear inside, like nodule or cysts, by showing the new spectral signatures and their special positions

pp. 154 -158

Numerical Modeling of a Micrometer Scaled Actuator Considering Different Force Calculation Methods

Thomas Preisner (Leibniz Universität Hannover, Germany); Christian Bolzmacher (EADS Innovation Works Germany, Germany); Andreas Gerber (CAU Kiel, Germany); Karin Bauer (EADS Innovation Works, Germany); Eckhard Quandt (CAU Kiel, Germany); Wolfgang Mathis (Universität Hannover, Germany)

A hybrid numerical model of a micromechanical actuator is presented. The investigated MEMS actuator consists of a thin micrometer coil and a permanent magnet, which are separated by an elastomer. Beside the numerical evaluation of the occuring magnetic fields with a hybrid FEM -BEM method, a comparison between different force calculation methods is given, which are opposed to laboratory measurements.

pp. 159 -163

IS1: Special Session on Nonlinear Dynamics 1

Genetic Algorithm Based Template Optimization for a Vision System Used for Obstacle Detection

Alireza Fasih (University of Klagenfurt, Austria); Kyandoghere Kyamakya (Alpen Adria University Klagenfurt, Austria); Umair Khan (Research Assistant, Austria)

A cellular neural based obstacle detection method based on a new approach for template optimization through a genetic algorithm is proposed. The proposed method uses "real number" chromosomes in the genetic algorithm; this eliminates the need of repeated encoding and decoding as in case of binary chromosomes. The method was also tested for a large number of other image processing tasks.

pp. 164 -168

Nonlinear Electric Circuit Analysis from a Differential Geometric Point of View

Wolfgang Mathis (Universität Hannover, Germany); Philipp Blanke (Universität Hannover, Germany); Martin Gutschke (Universität Hannover, Germany); Franz -Erich Wolter (Universität Hannover, Germany)

In this paper we will consider some theoretical aspects of a certain class of circuit equations from differential geometric point of view and present some methods in order to solve circuit equations by means of algorithms from computational differential geometry. We illustrate these methods by means of some simple circuit examples.

pp. 169 -172

Stability and bifurcation analysis in electronic oscillators: Theory and some experiments

Jacques Kengne (University of Dschang, Cameroon); Jean Chamberlain Chedjou (University Klagenfurt, Austria)

We consider the electronic structure of a shunt-fed Colpitts oscillator. The modeling process leads to the derivation of mathematical equations (ODEs) to model the behavior of the shunt-fed Colpitts oscillator. Using these equations the stability and bifurcation analyses are carried out and basins of attraction of stable solutions are obtained, as well as some bifurcation diagrams. Extensive analysis and experiments show the dynamical behavior of the proposed oscillator. The results obtained from the equations derived are validated by both a PSPICE simulation and by a real hardware implementation of the oscillator.

pp. 173 -177

On Conflict Sets in Parametric Space of Trigonometric Polynomials

Ladislav Novak (University of Novi Sad, Serbia); Anamarija Juhas (University of Novi Sad, Serbia)

Conflict sets appear in the parametric spaces of many engineering problems and their presence requires non -standard analytical tools and careful numerical treatments. In this article, we provide a note on conflict set, associated with an extremal problem of finding a non -negative trigonometric polynomial with the maximum amplitude of the fundamental harmonic, ensuring the maximum attainable efficiency of finite harmonic class C and class F power amplifiers.

pp. 178 -181

18:00 - 20:00

SP1: Guided walk through historical Luebeck

Tuesday, Jun 23

09:00 - 10:00

S3: Systems 3

Signal Competition Based Synthesis of Asynchronous High-Speed Digital Circuits

Valeri Mladenov (Technical University of Sofia, Bulgaria); Simona Petrakieva (Dr. Simona Petrakieva, Technical University of Sofia, Sofia, Bulgaria,, Bulgaria)

In this paper, we present a method for synthesis of asynchronous high-speed digital circuits. The synthesis problem consists of determining the delay of all asynchronous gates of the circuit, such that to avoid the signal competition. The method is based on determining all possible pairs of paths between every pair of gates in the circuit. Then the conditions for eliminating the signal competitions are transformed into a linear pro-gramming problem. The solution of this problem gives the desired delays of the asynchronous gates.

pp. 182-185

Second order statistics of selection macrodiversity system in the presence of Nakagami-m fading

Dragana Krstic (Faculty of Electronic Engineering, University of Niš, Serbia, Yugoslavia (defunct)); Mihajlo Stefanovic (Faculty of electronic engineering, Nis, Yugoslavia (defunct)); Stefan Panic (Faculty of Electronic Engineering, University of Niš, Serbia, Yugoslavia (defunct)); Goran Stamenovic (Tigar, Pirot, Yugoslavia (defunct)); Ivana Petrovic (High school for electrotechnics and computer science, Belgrade, Serbia)

In this paper second order statistics of SC (Selection Combining) macrodiversity system's output in the presence of Nakagami-m fading are analyzed. Macrodiversity system of SC type consists of two microdiversity systems and selection is based on their output signal's average power values. Each microdiversity system is of SC type with N branches in the presence of Nakagami-m fading. Average powers at the output are modeled by Gamma distribution. We have derived and graphically presented results for LCR (Level crossing rate) and AFD (Average Fading Duration) at the output of this system.

pp. 186-189

On the transfer behaviour of incremental Sigma Delta Converters

Stephan Bannwarth (Leibniz Universität Hannover, Germany)

An incremental Sigma Delta Analog to Digital Converter is a mixed analog and digital system with reset of internal states, resulting in a time varying system as a first approximation. During design it is important to know the transfer function of different internal circuit nodes towards the output. This makes it possible to determine the impact of individual nodes towards the output, regarding noise or signalcomponents. A new approach is presented employing methods of linear and time invariant (LTI) systems to derive transfer functions for this special kind of linear time varying sys-tem.

pp. 190-194

IS2: Special Session on Nonlinear Dynamics 2

Efficient Control of the dynamic system "Coordinated Urban Traffic Lights System" using a novel Reinforcement learning Concept.

Alireza Fasih (University of Klagenfurt, Austria); Kyandoghere Kyamakya (Alpen Adria University Klagenfurt, Austria); Jean Chamberlain Chedjou (University Klagenfurt, Austria); Umair Khan (Research Assistant, Austria)

In this paper authors will describe a new efficient method for coordinated urban traffic lights control. This method is based on enhanced reinforcement learning with local states around each traffic light. The system can learn in real-time mode by both a monitoring technique and a reward-punish policy. Designing this project is doable by minimum infrastructure and accessories. Each node try to self organize for getting the best decision for each state. A supervisor system monitors the effect of actions on states. The reward policy is based on this monitoring and tries to minimize the traffic at the different crossings.

pp. 195-198

On Transforming Graph Theoretical Problems into Optimization Problems and Solution using CNN-based Analog Computing

Tuan Do Trong (Hanoi University of Technology, Vietnam); Jean Chamberlain Chedjou (University Klagenfurt, Austria); Kyandoghere Kyamakya (Alpen Adria University Klagenfurt, Austria)

We present a novel method for transforming graph theoretical problems into optimization problems and calculating shortest path in both directed and undirected graphs. Analog Computing based on Cellular Neural Networks (CNN) paradigm is carried out to derive ultra-fast solutions when dealing with graphs of complex topology. As proof of concepts of the proposed method, simulations are performed on graphs of magnitude 11 and the results obtained show the efficiency of the novel method. The proposed method is challenging as it can be extended to solving scheduling issues in real-world scenarios which are NP-hard problems.

pp. 200-204

The paradigm of non-linear oscillators in image processing

Vamsi Prakash Makkapati (University of Klagenfurt, Austria); Muhammad Latif (Alpen Adria University Klagenfurt Austria, Austria); Jean Chamberlain Chedjou (University Klagenfurt, Austria); Kyandoghere Kyamakya (Alpen Adria University Klagenfurt, Austria)

A cellular neural network based edge detection method based on a new approach called "Translation residue method" is proposed. The proposed method is inspired from a traditional morphological edge detection method called the "Dilation residue method". Further, an image enhancement method proposed by Roska et.al. is modified and implemented on Matlab for simulation purposes.

pp. 205-209

10:00 - 10:35

T3: Tutorial 3

Discrete-time dynamics in nonlinear circuits

Orla Feely (University College Dublin, Ireland)

Nonlinear circuits, and the wide variety of dynamical behaviour that they can exhibit, have been the focus of much research attention over recent decades. However, relatively little of this attention has been focused on circuits and systems that operate in, or are best modelled in, discrete time. This talk will present an overview of discrete-time dynamics in a number of representative and important nonlinear circuits, including sigma-delta modulators, phase-locked loops and MEMS.

pp. 210-210

10:35 - 11:05

B4: Coffeebreak 3

11:05 - 12:35

IS3: Special Session on Education

Learning Optimal Synthesis of Voltage Regulator Circuits through Comparative Study in PSPICE

Galia Marinova (Technical University - Sofia, Bulgaria)

The paper presents a Learning Environment for Optimal Synthesis of Voltage Regulator Circuits (LEOS-VRC) using PSPICE simulator. LEOS-VRC can help teaching and self education in design of voltage regulator circuits. It's suitable for students in electronics, electrotechniques, telecommunications and computer-science engineering as well as doctoral students and designers of power supply circuits.

pp. 211-215

The Undergraduate Training on Simulating IP Networks Using Network Simulator NS2

Vladanka Acimovic-Raspopovic (University of Belgrade, Serbia); Mirjana Stojanovic (University of Belgrade, Serbia); Jelena Teodorovic (Institute for Educational Research, Serbia)

This paper presents the results of experimental undergraduate training on simulating IP (Internet Protocol) based networks, using Network Simulator version 2 (NS2) and its associated tools for simulation animation and analysis. An important objective of the training was to explore possibilities to introduce simulating IP networks as a regular course in undergraduate studies curriculum. The main contributions of the paper comprise introducing an innovative methodology for teaching simulation of IP networks to undergraduates, a dynamically created outcome of more than 100 scripts for programming the NS2, and presenting experiences in education with the simulator NS2.

pp. 216-219

Partial Element Equivalent Circuits – A Circuit Interpretation of Electromagnetic Field Problems

Günter Wollenberg (Otto-von-Guericke-University Magdeburg, Germany); Sergey Kochetov (Otto-von-Guericke-University Magdeburg, Germany)

The education of Theoretical Electrical Engineering is based on the three columns: fields, circuits, systems. These are taught more or less independently of each other. Thus, many interconnections between them are not explicitly addressed and remain unused for the learning and cognition process of the students. In the present paper is exemplary demonstrated how electromagnetic field problems of passive interconnection structures can be modelled by partial element equivalent circuits and calculated by circuit solvers. This is advantageous because the circuit interpretation is in particular familiar for electrical engineers and establishes a better understanding of electromagnetic processes.

pp. 220-223

Learning Environment for Design and Verification of Communication Circuits Realized on FPGA

Galia Marinova (Technical University - Sofia, Bulgaria)

The paper presents a Learning Environment for design and verification of communication circuits realized on FPGA, which is developed and applied in the laboratory for Computer-aided design in the Telecommunications faculty in Technical University (TU) – Sofia. IP blocks of digital signal processing functions and communication systems like modems and cryptoprocessors can be designed and tested in the environment.

pp. 224-226

F4: Fields 4

Lorentz Force Eddy Current Testing - A Simulation Study

Hartmut Brauer (Ilmenau University of Technology, Germany); Marek Ziolkowski (Ilmenau University of Technology, Germany)

The paper presents numerical simulations of the magnetic forces acting on a moving magnet due to the eddy currents of a Lorentz force eddy current testing system. Numerical simulations of quasi-static and transient approaches are accompanied by some asymptotic analytical solution and the operating linearity range of the Lorentz force sensor is estimated.

pp. 227-227

Green drive – technologies for sustainable mobility

Marcus Prochaska (NXP Semiconductors, Germany)

The improvement of fuel economy and the reduction of harmful emissions are major requirements to future automobiles. There are a lot of concept proposals for environment-friendly vehicles: hybrids, hydrogen or e-cars. In either case electronics will play an important role to make sustainable mobility come true. On this account electrical engineering will rise to challenges in various fields such as circuit design, packaging, networking, modelling and simulation. In the following automotive electronic systems for environment-friendly vehicles are presented and further research areas are shown.

pp. 228-230

Reduction of Network Models of Parasitic Coupling Effects in Mixed-Signal VLSI Circuits

Stefan Ludwig (University of Hannover, Germany); Wolfgang Mathis (Universität Hannover, Germany)

In this paper a method for the efficient reduction network models of parasitic couplings in modern integrated circuits is presented. The focus lies on the disturbance of the analog part generated by the digital switching currents. The parasitic effects are modeled by large RLC networks and current sources for the digital switching currents. Based on the determined behavior of the digital modules an efficient description of these networks is proposed, which allows for a higher model reduction than standard methods. The proposed method enables a fast and efficient simulation of the parasitic effects.

pp. 231-235

Numerical field simulation in electrical engineering devices: magneto-thermo-mechanical coupling

Mykhailo Panteliat (Institute of Problems in Machinery, Ukraine)

The paper is devoted to computer simulation of coupled magneto-thermo-mechanical processes in various electrical engineering devices (induction heaters, actuators, rotating electrical machines, etc.). The goal of the numerical analysis is to recommend their rational operation conditions and design. The paper presents mathematical models, numerical techniques and algorithms for finite element analysis of coupled nonlinear problems solution. A lot of numerical results describing solution of real-life problems of practical interest are presented and analyzed.

pp. 236-240

12:35 - 13:30

B5: Lunchbreak 2

13:30 - 14:30

P2: Poster 2

Bandpass Filters Using Folded Slots Etched in the Ground Plane

Gharbi Ramzi (Faculty of Sience of Tunisia, Tunisia)

Microstrip EBG structures are modelled in multilayered media. To analyze this type of structure an iterative method based on the concept of waves is presented to determine features of very high frequency's electronic circuits in a planar wave guide. The analysis takes into account eventual coupling parasites. In this paper, the proposed method is used to analysis a Novel micro strip filter configurations, incorporating EBG structures .These features can be used in bandpass filter application to eliminate unwanted frequencies and to reduce the physical size of microstrip circuits.

pp. 241-241

Calculation of Electro-Quasistatic Fields by BEM

Bojan Trkulja (University of Zagreb, Croatia); Armin Pavic (University of Zagreb, Croatia)

This work presents an accurate and efficient 3D calculation of electro-quasistatic fields of HV devices. Application of bicubic splines for interpolation functions ensures smooth approximation of surface sources, leading to high accuracy of computations. The computation is based on integral equations approach and Galerkin methods. Accuracy of proposed approach is tested with FEM.

pp. 242-244

Steady-State Analysis of an Electromagnetic Levitation Device by a New 3D Unstructured Finite Volume Method

Ahmed Cheriet (Biskra University, Algeria)

The standard finite volume method is featured by the simple shape of the control volume. Nevertheless, in previous works, we have demonstrates its efficiency in modeling of electromagnetic devices. On the other hand, the method appears too cost in the case of circular geometry because the shape simplicity of the discretization element. In order to overcome this problem, in this paper we proposes a new 3D unstructured finite volume method. The method is applied to solve an electromagnetic levitation problem.

pp. 245-245

Modelling of Effective Dielectric Properties of Inhomogeneous Mixtures in the Microwave Range

Tomasz Galek (Rostock University, Germany); Ursula van Rienen (University of Rostock, Germany)

In this work, the effective electric permittivity for dielectric mixtures is extracted from electromagnetic full 3D simulation data in the microwave range. The models of powder consist of periodically arranged spherical particles. The structures were excited with a plane wave and scattering parameters were simulated. Afterwards the effective properties were extracted. The knowledge of the effective properties can be helpful for understanding the basic physical phenomena as well as for further modelling and optimization.

pp. 247-247

Image Reconstruction with Electrical Capacitance Tomography and Position Determination of Reference Objects

Stefan Gebhardt (Technische Universität Ilmenau, Germany); Gernot Scheinert (Teschnische Universität Ilmenau, Germany)

A common application of electrical capacitance tomography (ECT) is the reconstruction of permittivity distribution, where the shapes of objects in the measuring zone are unknown. The authors investigated different approaches to estimate and improve the reconstruction quality of reference objects based on simulation data with ECT. The results allow successful determination of object positions with simple filter techniques.

pp. 248-251

Complex Permeability and Composite Materials

Peter Siroky (Alexander Dubcek University of Trencin, Slovakia); Jozef Sláma (Slovak University of Technology, Bratislava, Slovakia); Ján Petrilák (Alexander Dubcek University of Trencin, Slovakia); Ján Sitár (Alexander Dubcek University of Trencin, Slovakia)

The complex permeability and composite materials are made form Ni0,36Zn0,64 Fe2O4 ferrite material and the basic frequency characteristics and material properties will be presented in this article. The frequency range was measured up to 1GHz. We found the possibilities how to predict behavior of these composites up that frequency. It was realized basically on complex permeability and mathematical model of these ferrite materials.

pp. 252-256

Weighted Sum Method and Genetic Algorithm Based Multiobjective Optimization of an Exciter for Magnetic Induction Tomography

Marcin Ziolkowski (West Pomeranian University of Technology, Szczecin, Poland); Stanislaw Gratkowski (West Pomeranian University of Technology, Szczecin, Poland)

Magnetic Induction Tomography is a non-destructive testing technique for imaging the electrical conductivity of the object under test. The signals obtained with the help of

such a technique are extremely small, especially when imaging materials of low conductivity. In order to provide the highest sensitivity the MIT system must be designed very carefully. In this paper we present a modern methodology for the design of the excitation unit which, by coupling finite element method, genetic algorithm and the multi-objective optimization procedure based on weighted sum method, supports the design of the exciter and gives the optimal testing frequency.
pp. 257-261

Geometrical and shape parameters variation in the HF interconnects analysis.
Sebastian Kula (Technical University of Bucharest "Politehnica", Romania); Alexandra Stefanescu (Politehnica University of Bucharest, Numerical Methods Laboratory, Romania)
Abstract. In this paper we investigate the parametric variability analysis for interconnect structures working in the high frequencies. Our final goal is to compute p.u.l. characteristics of interconnect elements for the different geometrical, material and shape parameter values. We considered the case of a T-shape single transmission line parameterized by the position of the square part. Simulations have been made using parametric models based on the first order Taylor series expansion, analytical expressions and also polynomial/rational approximations. Our results were verified using commercial and academic software.
pp. 262-266

Shape design optimization of the excitation arrangement and superconducting bulks used in magnetic bearings
Paolo Di Barba (University of Pavia, Italy); Hardo May (Technical University of Brunswick, Germany); Maria Evelina Mognaschi (University of Pavia, Italy); Ryszard Palka (West Pomeranian University of Technology Szczecin, Poland); Antonio Savini (University of Pavia, Italy)
The paper deals with the design optimization of high temperature superconducting magnetic bearings (SMBs) used for high-speed machines. The proposed approach allows a multiobjective optimal design of SMBs with respect to the geometry of the excitation arrangement and the super-conducting bulk, in terms of both levitation force and material cost.
pp. 267-270

Domains of Validity of Quasistatic and Quasistationary Field Approximations
Thorsten Steinmetz (ABB Corporate Research, Switzerland); Stefan Kurz (ETAS GmbH, 70442 Stuttgart, Germany); Markus Clemens (Helmut-Schmidt-Universität, Germany)
The electro-quasistatic as well as the magneto-quasistationary approximation to Maxwell's equations are widely used to model slowly time-varying electromagnetic fields. An analysis based on the characteristic time of a given problem and the time constants of dielectric relaxation and magnetic diffusion is presented. This allows to decide if any of these approximations is valid for a given field problem.
pp. 271-275

A Semi-Analytical Approach for Low Frequency Plane Eddy Current Problem in Conductors with Various Cross-Sections
Lars Ole Fichte (Helmut-Schmidt-Universität, Germany); Markus Clemens (Helmut-Schmidt-Universität, Germany); Sebastian Lange (Helmut Schmidt University, Germany); Stefan Dickmann (HSU, Germany)
An area of conducting and permeable material with infinite length in the direction perpendicular to its cross section is placed in an external time-harmonic low-frequency magnetic field. This plane eddy current problem is solved by coupling the integral equation for the vector potential outside the conductor with a series representation for the vector potential inside the conductor that results from separation and allows orthogonalization of the resulting resulting boundary integral equation (BIE). Solving the resulting matrix equation yields unknown coefficients of the series. Focus of this paper are the kernel functions and series representations for differently shaped conductors.
pp. 276-280

Parametric Extraction of Lumped Via Models
Gerd Heinrich (Helmut-Schmidt-Universität/Universität der Bundeswehr Hamburg, Germany); Stefan Dickmann (HSU, Germany)
Vias in multilayer PCBs can be described using lumped models since their geometric dimensions are small in comparison to the signal wavelength. The elements of these models can be derived directly from physics and calculated using analytical formulas. When using these formulas as initial parameters for an optimisation algorithm the model parameters for a real via geometry can be extracted using the reference data from measurements or numerical simulations.
pp. 282-285

Multimedia Platform with Wireless Access for E-Learning
Mariana Jurian (University of Pitesti, Romania); Ioan Lita (University of Pitesti, Romania); Daniel Alexandru Visan (University of Pitesti, Romania); Bogdan Cioc (University of Pitesti, Romania)
In this paper are presented the guidelines for an implementation solution of a multimedia platform used for distance learning experiments. The proposed multimedia platform make use of WiFi transmissions technology in order to realise wireless access to the e-learning platform of the users or between user's laboratories placed at reduced distances (in a building). Using combined WiFi and Internet network it is are also intend to realize e-learning activities between Pitesti University and other three Universities (Politechnica University, University from Cluj and University from Iasi). The connection between these locations is realised through secured VPN tunnels.
pp. 286-289

Microbunch Instabilities Driven by Space Charges in Linacs
Sebastian Lange (Helmut Schmidt University, Germany); Markus Clemens (Helmut-Schmidt-Universität, Germany); Lars Ole Fichte (Helmut-Schmidt-Universität, Germany)
One of the design criterions of linear accelerators (linac) and linac-based light sources is the longitudinal phase space. Microbunching instabilities are mainly driven by longitudinal space charge (LSC) forces. In order to simulate sub-bunch effects, a periodical model based upon a semi-analytical method, which describes the LSC driven amplification of fluctuations (gain) in the charged particle beams is proposed here.
pp. 290-293

Modelling of eddy-currents using electric scalar potential
Przemyslaw Plonecki (Warsaw University of Technology, Poland); Jacek Starzynski (Warsaw University of Technology, Poland); Stanislaw Wincenciak (Warsaw University of Technology, Poland); Bartosz Sawicki (Warsaw University of Technology, Poland)
This work presents a method of modelling eddy-currents excited in low conducting areas by low frequency magnetic field. The authors suggest a new method for simulation of the phenomenon on the basis of a popular model using the electric scalar potential. Proposed model use the condition for continuity of a current density J on the material non-homogeneity borders. The numerical experimentproves an advantage of this method for computationally exhaustive large biomedical models, build on the basis of MRI scans.
pp. 294-298

Advanced visualization system for demonstrating data obtained from NDT measurements
Tomasz Chady (West Pomeranian University of Technology, Poland); Ryszard Sikora (West Pomeranian University of Technology, Poland); Piotr Baniukiewicz (West Pomeranian University of Technology, Poland); Jacek Kowalczyk (West Pomeranian University of Technology, Poland)
In this paper, a novel method of visualisation of measurement results is presented. The method utilizes a video camera and LCD projector for real-time projection of the results of measurements on measured specimen. The advanced visualisation system is a part of complex measurement system, which allows to perform measurement in fully automatic way.
pp. 299-302

Limited view reconstruction of three-dimensional defect distribution for computed radiography system
Wojciech Chlewicki (West Pomeranian University of Technology, Poland); Piotr Baniukiewicz (West Pomeranian University of Technology, Poland); Andrzej Brykalski (West Pomeranian University of Technology, Szczecin, Poland); Tomasz Chady (West Pomeranian University of Technology, Poland)
In this work we present limited angle reconstruction algorithms combined with procedure for defect detection in three dimensions. A computer radiography system is utilized for radiographic images acquisition. Number of necessary projections, as well as influence of the noise on image quality of the reconstruction were investigated and results obtained real and simulated radiographs are provided.
pp. 303-305

Testing of Composite Materials Using Advanced NDT Methods
Przemyslaw Lopato (West Pomeranian University of Technology, Szczecin, Poland); Tomasz Chady (West Pomeranian University of Technology, Poland); Ryszard Sikora (West Pomeranian University of Technology, Poland)
Today modern industry make very extensive use of various composite materials. Because of complexity of such structures, abilities of commonly used NDT methods sometimes are not sufficient. More advanced techniques should be utilized. In this paper both T-Ray (terahertz radiation) and low energy DR (Digital Radiography) methods are described and compared for the purposes of various composite materials evaluation. Different types of tested materials (glass fiber and carbon fiber composite structures) and defects such as delaminations, mechanical and heat damages will be analysed.
pp. 306-308

On the Transparent Boundary Conditions (TBC) for the Parabolic Wave Equation
Lubomir Sumichrast (Slovak University of Technology, Slovakia); Matthias Ehrhardt (Weierstrass Institute for Applied Analysis and Stochastics, Germany)
For the simulation of the propagation of electromagnetic waves is in certain situations the parabolic approximation of the scalar wave equation commonly used. It is important to have well-performing transparent boundary conditions applied on the boundaries of the finite computational window, to enable the superfluous portion of the propagating wave to radiate away from the e.g. wave guiding structure. Four different formulations (continuous, two kinds of semi-discrete and one fully-discrete) of the non-local transparent boundary conditions are described and their performance compared.
pp. 309-309

Numerical Solution of Open-Boundary Skin Effect Problems by means of a Non-Standard FE-BE Method
Salvatore Alfonzetti (University of Catania, Italy); Nunzio Salerno (University of Catania, Italy)
This paper describes the numerical solution of open-boundary skin effect problems by means of the hybrid FE-BE method. A new family of simplex nodal boundary elements was proposed in which the nodes of the magnetic vector potential are placed in the canonical positions, whereas the nodes of its normal derivative are placed in between them and internally to the element, in such a way that the fact that one variable is the derivative of the other is fully exploited.
pp. 310-313

Electric Field Near Bundle Conductors

Daniel Mayer (University of West Bohemia in Pilsen, Czech Republic)
The paper deals with computation of electric field distribution along the surfaces of a system of parallel conductors with various potentials. The method starts from integral equations and the elaborated algorithm is applied to hv and uhv overhead lines with bundle conductors. The results allow evaluating of danger of giving rise to corona (even with respecting the influence of rough surface of the cable) with all its interference effects.
pp. 314-317

14:30 - 15:00

B6: Coffeebreak 4

15:00 - 15:35

T4: Tutorial 4

Ensemble of Predictors for Forecasting the PM10 Pollution
Stanislaw Osowski (Warsaw University of Technology, Poland); Krzysztof Siwek (Warsaw University of Technology, Poland)
The paper presents the novel approach to the accurate forecasting of the daily average concentration of PM10. It is based on the application of SVM network and wavelet transformation of the time series representing PM10 pollution. The main novelty of the proposed approach is the application of the ensemble of predictors, integrated using the blind source separation method. The numerical experiments of predicting the daily concentration of the PM10 pollution in Warsaw have shown good overall accuracy of prediction in terms of RMSE, MAE and MAPE errors as well as correlation and index of agreement measures.
pp. 318-322

15:35 - 16:55

S4: Systems 4

A Novel CMOS Operational Amplifier with two Differential Input Stages
Björn Lipka (Otto-von-Guericke Universität Magdeburg, Germany)
A novel CMOS operational amplifier with two differential stages has been fabricated and has been measured successfully. A nested Miller compensation is used to ensure a stable operation. The layout has been created automatically by using the ALADIN tool [3]. The measurement results show that the amplifier has sufficient phase margin.
pp. 323-325

Experimental evaluation of the current-phase relation of a Josephson junction
Olaf Mielke (Ilmenau University of Technology, Germany)
The Josephson junction is the active component of superconducting electronics. The behaviour of this nonlinear element is characterized by the relation between current and the quantum mechanical phase-difference. For an accurate device modelling detailed knowledge about this relation is necessary. To obtain detailed information, a direct measurement of the current-phase relation was accomplished.
pp. 327-331

Noise Analysis in RF CMOS active switching Mixers
Ahmed Darrat (Leibniz University of Hannover, Germany); Wolfgang Mathis (Universität Hannover, Germany)
This paper discusses the dependency of noise in switching mixers on the characteristics of the switching stage. Considering non-ideal switching, it is shown that the parameters of the switching stage affect the total noise produced at the mixer's output. Including thermal and flicker noise, an analytical expression for noise in dependency on the technology and architecture parameters, as well as the local oscillator signal, is derived.
pp. 332-336

An efficient VCO Design Flow using the Method of Harmonic Balance
Jan Bremer (Leibniz University of Hanover, Germany); Christoph Zorn (Leibniz University of Hanover, Germany); Jan Przytarski (Leibniz University of Hanover, Germany); Wolfgang Mathis (Universität Hannover, Germany)
In this work a nonlinear systematic design procedure for an efficient VCO design based on the subsequent usage of bifurcation analysis and the harmonic balance method is presented. Using the Andronov-Hopf bifurcation anlysis an approximation of the periodic solution of the nonlinear dynamic system representing the VCO is computed. This approximated solution serves as an optimal initial value for the method of Harmonic Balance. The validity of the method is verified by designing a VCO in the GHz regime using a RF CMOS technology.
pp. 337-341

IS4: Special Session on Nonlinear Dynamics 3

Benchmarking of the Traditional Genetic Algorithm Method with a Novell Approach and a further novel Scheme, the "2-Point Crossover (F-Crossover)"
Alireza Fasih (University of Klagenfurt, Austria); Jean Chamberlain Chedjou (University Klagenfurt, Austria); Kyandoghere Kyamakya (Alpen Adria University Klagenfurt, Austria); Umair Khan (Research Assistant, Austria)
A benchmarking using cellular neural networks is performed between the traditional Genetic algorithm method (using binary population of random chromosomes) with a new approach of genetic algorithm (using real numbers population). The benchmarking was done with various image processing operations and it is shown that there is no difference between the two approaches. Real numbers population prevents the repeated encoding and decoding of chromosomes. Also the sizes of chromosomes are relatively smaller. Moreover, a modified scheme, the 2-point crossover (F-Crossover) is introduced, which significantly decreases the convergence time of the genetic algorithm.
pp. 342-346

Implementing a CNN Universal Machine on FPGA: state-of-the-art and key challenges
Christopher SchwarzImüller (Klagenfurt University, Austria)
A Cellular Neural Network Universal Machine is an extension of the CNN concept. An implementation or emulation of a CNN-UM on FPGA is very attractive because the full computational power of CNN processor comes to a life only in a digital, reconfigurable, scalable and thus flexible hardware platform. Beside FPGA there are many other different possibilities and options to implement a CNN-UM. This paper formulates the related challenges and gives an overview over actual CNN-UM implementations, compares them, and gives advice for which applications they are suited best.
pp. 347-351

Design and Simulation of Circuit for Synchronization of Multidelay Feedback Systems
Thang Hoang (Hanoi University of Technology, Vietnam); Nguyen Dzung (Hanoi University of Technology, Vietnam); Van Duc Nguyen (Hanoi University of Technology, Vietnam); Jean Chamberlain Chedjou (University Klagenfurt, Austria); Kyandoghere Kyamakya (Alpen Adria University Klagenfurt, Austria)
This paper presents the design of electronic circuit for multidelay feedback systems and synchronization of multidelay feedback systems. There, dynamical equation for driving signal is in the form of the sum of multiple nonlinear transformations of delayed state variable. The circuit of modified Mackey-Glass system and synchronization are demonstrated by SPICE. The simulation results proof the existence of the scheme of complete synchronization between the Master and Slave and synchronization is maintained during interaction.
pp. 352-355

Use of CNN processors for ultra-fast solution ODE's and PDE's: A renaissance of the analog computer
Jean Chamberlain Chedjou (University Klagenfurt, Austria); Alireza Fasih (University of Klagenfurt, Austria); Patrik Grausberg (Universiy of Klagenfurt, Austria)
This paper provides basics of the methods based on the CNNs paradigm that can be exploited for analog computing of very complex systems which are modelled by ODEs and/or PDEs (an implementation on chip using CNN technology is possible even an emulation in FPGA). A proof of concept of the computing approach developed in this paper is validated by solving some complex ODEs and/or PDEs models and by comparing the results obtained with those available in the litera-ture (benchmarking). The computation based CNNs paradigm is advantageous as it provides accurate and ultra-fast solutions of very complex ODEs and PDEs.
pp. 357-360

19:00 - 23:00

SP2: Symposium banquet at the Moevenpick Hotel Luebeck

Wednesday, Jun 24

09:00 - 10:00

IS5: Special Session on EMC 1

Description of Non-Quasistatic Effects using Partial Elements

Reza Kazemzadeh (Leibniz University of Hannover, Germany); Wolfgang Mathis (Universität Hannover, Germany)

In this work, a perception of the retarded Partial Element Equivalent Circuit (rPEEC) approach with focus on the effect of the displacement current on the circuit elements is given. By a decomposition of the phase term, an ostensive description of the resulting term's influence on the different types of circuit elements of the model can be obtained. Areas of application for the presented variant are being shown.

pp. 361-365

Modeling a Power MOSFET for EMC analysis

Sven Thamm (University of Magdeburg, Germany); Marco Leone (University of Magdeburg, Germany)

This paper presents an efficient approach to model the behavior of a Power MOSFET for EMC simulation purposes. The SPICE-compatible circuit description of the macromodel ensures the integration in different simulation environments. The suggested macromodeling technique is demonstrated for typical applications in power electronics. Validation is carried out by comparison with reference simulations using a standard SPICE library MOSFET model.

pp. 366-369

Active, Passive and Dynamic Shielding of Static and Low Frequency Magnetic Fields

Marcin Ziolkowski (West Pomeranian University of Technology, Szczecin, Poland); Stanislaw Gratkowski (West Pomeranian University of Technology, Szczecin, Poland)

Three kinds of static and low-frequency magnetic fields shielding are known, namely, active, passive and dynamic. In this paper we discuss each of them, while a special emphasis is put on active shielding. Such a shielding uses coils with currents that generate magnetic fields of the same frequency and amplitude as the external field but in the opposite direction. From mathematical point of view these problems belong to ill posed nonlinear inverse problems and require special treatment. A method for designing a shape of the coils is given in the paper.

pp. 370-374

S5: Systems 5

Obtaining Tolerance Region for Fault Diagnosis Algorithm

Marek Ossowski (Technical University of Lodz, Poland); Andrzej Kuczynski (Technical University of Lodz, Poland)

A new approach for improving the efficiency of some transient-response based fault diagnosis algorithms is presented, discussed and numerically illustrated. Evolutionary procedure was used to define boundary curves for tolerance regions in time domain circuit analysis. Some consideration due to a problem of DWT and multi-resolution signal representations are also included.

pp. 375-378

An Accelerated Genetic Reconstruction Algorithm for Inverse EIT Problems

Vassil Guliashki (Institute of Information Technologies - BAS, Bulgaria)

We propose an accelerated hybrid genetic algorithm for the inverse nonlinear problem of Electrical Impedance Tomography (EIT). It belongs to the interior algorithms. Finite Element Method is used to solve the forward EIT problem regarding the nodal scalar potentials and current density values. The corresponding computer program is used for education in biomedical signal processing and inverse problems solving.

pp. 379-382

Relations of GA operators & Resemblance in Different Crossover Operators - an overview

Pallavi Chaudhari (Sr. Lecturer , P. I. E. T. , Nagpur , India, India)

Relations of GA operators & Resemblance in Different Crossover Operators - an overview Mrs.Pallavi M. Chaudhari Lecturer, Department of Information Technology, P.I.E.T., Nagpur, India Abstract It is clear from the description of the working principles of a GA that GA operators are tunable with the parameters associated with each of them. Since there exist flexibilities, for changing the importance of one operator over another or flexibilities in using a different representation scheme to suit a problem, GAs are widely applicable to various types of problems. Comparative study of crossover operators will help to analyze their behavior.

pp. 383-383

10:00 - 10:35

T5: Tutorial 5

Recent progress in EMC and reliability for automotive applications

Lionel Pichon (Laboratoire de Génie Electrique de Paris - CNRS, France); Smail Mostafa Kamel (Laboratoire de Génie Electrique de Paris, France)

This paper presents a methodology dedicated to the reflectometry analysis of a branched network in order to localize and characterize the faults which may affect it. Genetic algorithms are combined with a wire propagation model to perform the inverse problem and deduce physical information's about defects from the reflectometry response.

pp. 384-388

10:35 - 11:05

B7: Coffeebreak 5

11:05 - 12:05

IS6: Special Session on EMC 2

Near-field shielding effectiveness for a Huygens source

Christian Moeller (University of Kiel, Germany); Ludger Klinkenbusch (Christian-Albrechts-Universitaet zu Kiel, Germany)

The recently proposed transient shielding effectiveness (SE) is investigated for a near-field Huygens source. It is shown, that similar normalization factors as introduced in case of electrical and magnetic dipoles are valid and can easily being combined for the present case. The analysis ends up with a transient SE which is more realistic as compared to several types of actual near-field sources. Moreover the results for that case are better compatible with plane-wave (far-field) illuminations. Numerical results confirm the theoretical derivations.

pp. 389-392

Coupling from HF Transmitter to Power Line Communications System using Antenna Theory - Analytical versus Numerical Approach

Dragan Poljak (University of Split, Croatia)

Antenna model of a straight power line has been presented in the paper. The power line, as a part of Power Line Communication (PLC) system is excited by HF electric field excitation. The induced currentdistribution above a finitely conducting ground has been assessed by solving the corresponding Pocklington integro-differential equation via analytical and numerical approach, respectively. Some illustrative computational results are presented in this work.

pp. 394-396

Integrated Active Sensors for Near-Field Scanning

Nasir Uddin (University of Paderborn, Germany)

This paper describes the design, simulation and measurement of integrated active sensors in OMMIC ED02AH GaAs technology for near-field scanning. Electromagnetic field simulation and on-wafer measurement have been performed for the miniature integrated sensors (loop and dipole). Two wideband amplifiers with a gain of 22 dB and 28 dB respectively and a bandwidth of about 10 GHz are designed and measurement results are presented. Finally, frequency responses of the active sensors are reported.

pp. 398-402

12:05 - 12:20