

Department of Theory of Electrical Engineering

CPEE - AMTEE 2013

Joint conference

Computational Problems of Electrical Engineering and Advanced Methods of the Theory of Electrical Engineering

4th – 6th September 2013 Roztoky u Křivoklátu, Czech Republic

Welcome Address by the Scientific Committee of the Conference

On behalf of the Scientific Committee I would like to cordially welcome you to the Joint conference Computational Problems of Electrical Engineering (CPEE) and Advanced Methods of the Theory of Electrical Engineering (AMTEE) that takes place in Roztoky u Křivoklátu, the village situated amidst the Protected Landscape Area of Křivoklátsko.

The history of the CPEE Conference (Computational Problems of Electrical Engineering) started in 1999, after an agreement among several Polish and Ukrainian universities. The main role was played by the Warsaw University of Technology (Poland) and Lviv Polytechnic National University (Ukraine). Since the very beginning, the conference was organized every year and its principal aim was to discuss the modern trends in computational electrical engineering (mostly signal, circuit and field theories) leading to novel approaches to the numerical analysis, optimization and design of various electrical machines, apparatus and systems. In the first years, only Polish and Ukrainian scientists and researches took part in this event. Later also participants from other countries such as Russia, Czech Republic, Slovakia, Hungary and also from Great Britain, France and Japan became regular participants. In 2010, the Czech Republic was appointed the third organizing country.

The history of the AMTEE Conference (Advanced Methods of Theory of Electrical Engineering) began in 1993; since then ten sessions were held almost regularly in two-year intervals. At the very beginning, mostly the domestic participants and participants from few surrounding countries took part there, but in the course of time the Conference gradually gained its international reputation.

We hope that even the this year's meeting will create a bridge among scientists, academicians, engineers and all those who are interested or work in the field of the Conference topics. We would like to establish a good forum for international exchange on the contemporary and future development in the domain of Theory of Electrical Engineering and associated disciplines.

Beside the scientific program, CPEE – AMTEE 2013 is supposed to provide time enough for finding new personal contacts, friendships and, of course, for discussions. Therefore, social meetings are also planned such as an evening party and an interesting trip.

It was our great pleasure to invite you to this event, where professional interests will be combined with a rich social program. We wish you cordially a pleasant stay in Roztoky u Křivoklátu and a good return home.

On behalf of the Program Committee of the Conference Ivo Doležel, chairman of the conference

selyl C

Programme Committee

Chairman of the Joint Conference

I. Doležel University of West Bohemia in Pilsen

CPEE Scientific Committee

S. Bolkowski Warsaw University of Technology - chairman

I. Doležel University of West Bohemia in Pilsen - vicechairman

P. Stakchiv National University "Lvivska Polytechnica" - vicechairman

J. Bobalo National University "Lvivska Polytechnica"

L. Byczkowska-Technical University of Lodz Lipinska

A. Cichocki Brain Science Institute RIKEN Tokyo

Z. Ciok Polish Academy of Sciences P. Fiala Brno University of Technology T. Glinka Silesian University of Technology

L. Janoušek University of Zilina

T. Kaczorek Polish Academy of Sciences

P. Kazmierkowski Warsaw University of Technology O. Kyrylenko Ukrainian Academy of Sciences T. Lobos Technical University of Wroclaw

National University "Lvivska Polytechnica" A. Lozinskyy

K. Mikolajuk Warsaw University of Technology M. Myslovitch Ukrainian Academy of Sciences S. Osowski Warsaw University of Technology A. Richter Technical University of Liberec N. Shydlovska Ukrainian Academy of Sciences J. Sikora Warsaw University of Technology R. Sikora Technical University of Szczecin Warsaw University of Technology J. Starzynski M. Tadeusiewicz Technical University of Lodz B. Ulrych University of West Bohemia Warsaw University of Technology S. Wincenciak

P. Zaskalicky **Technical University of Kosice**

AMTEE Scientific Committee

J. BarglikB. BaronSilesian University of Technology, KatowiceSilesian University of Technology, Gliwice

Z. Benešová University of West Bohemia in Pilsen

D. Biolek University of Defence, Brno
K. Čápová Technical University, Zilina
J. Dědková Technical University, Brno

V. Havlíček
 J. Hrušák
 J. Kotlan
 Czech Technical University, Prague
 University of West Bohemia in Pilsen
 University of West Bohemia in Pilsen

D. Kováč Technical University, Kosice

D. Mayer University of West Bohemia in PilsenM. Mazánek Czech Technical University, Prague

M. Pasko Silesian University of Technology, Gliwice

B. Skala University of West Bohemia in Pilsen
J. Sláma Slovak Technical University, Bratislava
L. Šumichrast Slovak Technical University, Bratislava
B. Ulrych University of West Bohemia in Pilsen
V. Valouch Czech Academy of Sciences, Prague

Local Organization Committee

I. Doležel	University of West Bohemia in Pilsen, Czech Republic
P. Karban	University of West Bohemia in Pilsen, Czech Republic
P. Kropík	University of West Bohemia in Pilsen, Czech Republic
L. Šroubová	University of West Bohemia in Pilsen, Czech Republic
V. Kotlan	University of West Bohemia in Pilsen, Czech Republic
R. Hamar	University of West Bohemia in Pilsen, Czech Republic

Contents

I. Electromagnetic field theory

Baron Bernard, Jabłoński Paweł, Kusiak Dariusz, Pasierbek Artur, Piatek Zygmunt, Szczegielniak Tomasz	A numerical method for magnetic field determination in three- phase bus-bars of rectangular cross section	I-1
Karban Pavel, Korous Lukáš, Kůs Pavel, Mach František	Calculation of Force Acting on the Armature of Electromagnetic Actuator	I-2
Rendzinyak Serhiy, Trushakov Dmitro, Vasylchyshyn Ivanna	Determining of complex magnetic permeability of the ferromagnetic material by complex impedance of inductance coil with ferromagnetic core	I-3
Howykowycz Mariya	Development of "surface" shape functions on the basis of invariant approximations technique	I-4
Macháč Jan	Dispersion characteristic of a 1D periodic structure	I-5
Jansa Jindřich, Karban Pavel	Eddy Current Defectoscopy with Utilisation of Cross- Correlation	I-6
Mayer Daniel, Ulrych Bohuš	Evaluation of the linearization of mathematical models of AC magnetic circuits	I-7
Chaber Bartosz, Starzyński Jacek	FEM antenna model verified against measurements	I-8
Sowa Marcin	Influence of BDF order on FEM computation	I-9
Faktorová Dagmar, Pápežová Mária	Optimization of Mild Microwave Hyperthermia Interconnection with Targeted Delivery of Nanoparticles	I-10
Hamar Roman, Kropík Petr, Šroubová Lenka	The Influence of Suspension Towers on the Directional Energy Flux Density along a Transmission Route	I-11
Ulrych Bohuš, Voráček Lukáš	The numerical solutions and experimental verification of transient demagnetization of the permanent magnet	I-12

II. Network theory and its application

Halgas Stanislaw, Tadeusiewicz Michał	An algorithm for finding multiple DC operating points	II-1
Jakubowska Agnieszka, Mazurkiewicz Seweryn, Walczak Janusz	Analysis of linear stochastic dynamic systems of the n-th order of the method of moments	II-2
Korud Andriy, Korud Vasyl	Effective implementation methods of FIR filters in FPGA-based signal processing systems	II-3
Mikołajuk Kazimierz, Osowski Stanislaw, Tobola Andrzej	Feedback control and optimization method for voltage harmonic damping	II-4
Mandziy Bohdan, Shapovalov Yuriy	Frequency Symbolic Analysis of Linear Periodically Time- Variable Circuits with Many Parametric Elements	II-5

Lewandowski Michał, Walczak Janusz	Noise immunity evaluation of nonlinear load frequency model estimation method	II-6
Nawrowski Ryszard, Wawrzyniak Tomasz	Simulation of a CDI digital ignition module	II-7
Maksymyuk Taras, Strykhalyuk Igor	Spectrum sharing in infrastructure based Cognitive Radio networks	II-8
Kuczyński Andrzej	Testing nonlinear analog circuits by supply current variation and supply voltage monitoring	II-9
Holajn Piotr, Sztymelski Krzysztof	The second order LP filtering structures using the CCC	II-10
Irzmański Paweł, Jóśko Adam	Wavelet based approach to the adaptive analysis of electrocardiography signals	II-11

III. Nonlinear phenomena in engineering science

Pilśniak Adam	An idea of the 5th stage power domain ELIN RMS-to-DC converter	III-1
Korzybski Marek, Ossowski Marek	Improved ranking list classifier for analog circuts fault diagnosis	III-2
Chenchevoi Volodymyr, Ogar Vita, Svystun Anton, Zagirnyak Mykhaylo	Induction Motor Characteristics Taking into Account the Variations of Magnetic System Properties	III-3
Jakubowska Agnieszka, Walczak Janusz	Phase resonance in series fractional RL(beta)C(alfa) circuit	III-4
Holajn Piotr, Pilśniak Adam	Reduction of divider circuit errors	III-5
Korzybski Marek, Ossowski Marek	Soft fault diagnosis based on the Pearson correlation	III-6
Jarmuda Tomasz	Thermal model of an intelligent house	III-7

IV. Material modeling and measuring

Janoušek Ladislav, Smetana Milan, Strapacova Tatiana	Detection of steel phase transition using magneto-resistive sensors in eddy current testing	IV-1
Emets Volodymyr, Rogowski Jan	Diffraction of Longitudinal Shear Waves on a Thin Piezoelectric Inclusion of Arbitrary Rigidity	IV-2
Hamola Marta, Hamola Orest, Horyachko Vsevolod	Electromagnetic circuit model of the eddy current defectoscope	IV-3
Doležel Ivo, Kacerovský Jan, Karban Pavel, Mach František, Štarman Václav	Impact of Humidity on Efficiency of Triboelectric Separator for Mixture of Plastic Particles	IV-4
Doležel Ivo, Hamar Roman, Kotlan Václav, Pánek David	Modeling and Control of Laser Hardening	IV-5

Klym Halyna	Modelling of nanopore size distribution in humidity-sensitive ceramic materials	IV-6
Duca Anton, Janoušek Ladislav, Rebican Mihai, Smetana Milan, Strapacova Tatiana	Non-destructive assessment of three-dimensional profile of real cracks from eddy current testing signals	IV-7
Krzemiński Stanisław, Przybylski Piotr	Numerical Model of Ions Transport in Biomembrane Channel	IV-8
Kubát Miroslav, Polcar Petr	On Measurement of Permeability of Magnetic Liquids	IV-9
Košek Miloslav, Novak Miroslav	Simple and Robust Equivalent Circuit of Real Transformer for Harmonic Excitation	IV-10
Pogrebisskiy Mikhail, Shageev Emil	The accelerated controlled cooling of products in the vacuum resistance furnace with mobile thermal insulation	IV-11

V. Electrical machines and apparatus

Nawrowski Ryszard, Zbigniew Stein, Zielińska Maria	Analysis of the effect of the parameters of distribution transformers on economic electric energy transmission in low-voltage networks	V-1
Kazakov Yury, Tikhonov A.I.	Calculation of traction induction motor using dynamic model of the field	V-2
Kazakov Yury, Shvetsov N.K.	Energy efficiency calculation of traction asynchronous motor with impulse supplying using finite element modeling of electromagnetic field	V-3
Bobalo Yuriy, Kiselychnyk Myroslav, Melen Myhaylo, Nedostup Leonid, Zayarnyuk Pavlo	Multi-criteria optimization of quality and reliability providing processes of electronic devices	V-4
Krawczyk Zuzanna, Nikoniuk Marcin, Starzyński Jacek	Numerical models of the prototype transformer for inductive contactless energy transfer system	V-5
Chenchevoi Volodymyr, Svystun Anton, Zagirnyak Mykhaylo, Zachepa Iurii	Research of Self-Contained Induction Generator Characteristics During Direct Current Consumers Supply	V-6
Byczkowska-Lipińska Liliana, Kozak Yuriy, Spivak Iryna, Stakhiv Petro	Simulation of quasi-periodic processes in dynamic systems based on optimization approach	V-7
Nawrowski Ryszard, Zbigniew Stein, Zielińska Maria	Study on the effect of asymmetric load of MV/LV transformers on the voltage unbalance factor in low voltage network	V-8

VI. Power engineering

Majka Łukasz, Szuster Dominik	A stationary DC decay test on the 7.5 MVA turbogenerator installed in a thermal power plant	VI-1
Bugała Artur, Frydrychowicz-Jastrzębska Grażyna	An original design and implementation of a stand used to test the power efficiency of two-axis tracking structures in photovoltaics	VI-2
Putz Lukasz, Typańska Dorota	Analysis of the electrical parameters of electroluminescent lighting in the lobby of an office building	VI-3
Paszek Stefan, Pruski Piotr	Calculation of electromechanical eigenvalues based on measured instantaneous power waveforms	VI-4
Nawrowski Artur	Comparative analysis of the application of light fields in the illumination of selected architectural objects of Prague and Poznan city	VI-5
Głuchy Damian, Kurz Dariusz, Trzmiel Grzegorz	Correction factor of the influence of the horizon on the shading of a photovoltaic installation	VI-6
Pasierbek Artur, Sokół Radosław	Database for power system	VI-7
Filipiak Michał	Designing wireless power supply systems	VI-8
Brociek Wieslaw, Filipowicz Stefan, Wilanowicz Robert	Estimation of deformation of the voltage in the power system supplying 12-pulse rectifier	VI-9
Benešová Zdeňka, Kotlan Václav	Mathematical model of MOV surge arrester	VI-10
Paranchuk Roman, Paranchuk Yaroslav	Neural Network Based Steel Melting Furnace Short Circuit Parameters Identification	VI-11
Jajczyk Jarosław	Optimization calculations on a computer cluster	VI-12
Głuchy Damian, Kurz Dariusz, Trzmiel Grzegorz	Photovoltaic Thermal Systems - Energy of the Future or a Gadget	VI-13
Matsyhin Andrii, Paranchuk Yaroslav	Research of the arcs lengths system regulation modes of an electric arc furnace with the neuro-controllers	VI-14
Baron Bernard, Kraszewski Tomasz, Świszcz Piotr	The submerged arc furnace state of work in the frequency domain	VI-15
Skowronek Konrad, Typańska Dorota	Using uninterruptible power supply devices as protection against power disruptions in an "intelligent building"	VI-16

VII. Coupled problems

Dyvak Mykola, Padletska Natalia, Pukas Andriy	An algorithm of receiving the interval characteristics of information signal in the task of identification the recurrent laryngeal nerve	VII-1
Osowski Stanislaw, Siwek Krzysztof	Comparison of Methods of Feature Generation for Face Recognition	VII-2
Gombarska Daniela	ECT measurement in bio-application	VII-3

Kasprzyk Leszek	Energy consumption analysis of motor vehicles	VII-4
Bobalo Yuriy, Krepych Svitlana, Stakhiv Petro	Evaluation of the functional suitability of the device considering the technological parameters of random deviations from the nominal component aging processes	VII-5
Rendzinyak Serhiy	Mathematical models of the subsystems with distributed parameters for the transient simulation of electric circuits by diakoptic methods	VII-6
Filipowicz Stefan, Marcin Matacz, Niedbalski Paweł	Neurofeedback method – what might influence on therapy BFB results	VII-7
Lozynsky Orest, Mandziy Bohdan, Shcherbovskykh Serhiy	Reliability model for failure cause analysis of electrical system with component load-sharing redundancy	VII-8
Fabirovskyy Serhiy, Kondratov Peter, Lazko Leonid, Prudyus Ivan, Tkachenko Victor	Spectral Based Approach of Subpixel Image Formation	VII-9
Kotlan Václav, Koudela Lukáš	The influence of arrangement of pernament magnets to rotation heating of ferromagnetic shrink-fit	VII-10
Beňová Mariana, Dobrucký Branislav	Using Z-transform for solution of steady state and transient state in single-phase voltage inverter system	VII-11

VIII. Education

Dmytryshyn Roman	Computational Problem of the Determinant Matrix Calculation	
Doležel Ivo, Karban Pavel, Kůs Pavel, Mach František	Mathematical modelling of direct current corona discharge problems in air	VIII-2
Głuchy Damian, Kurz Dariusz, Trzmiel Grzegorz	Research of the hydrogen fuel cell working with electrolyser powered energy from photovoltaic conversion	VIII-3

IX. Informatics

Połomski Marcin, Wieczorek Bożena	Speedup and accuracy of parallel simulated annealing algorithms Virtual market for trustworthy peer-to-peer computing systems	
Sawicki Bartosz, Zochniak Michal		