WOFEX 2011
proceedings of the 9th annual workshop

WOFEX 2011

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Ostrava, 8th – 9th September 2011
Proceedings of papers

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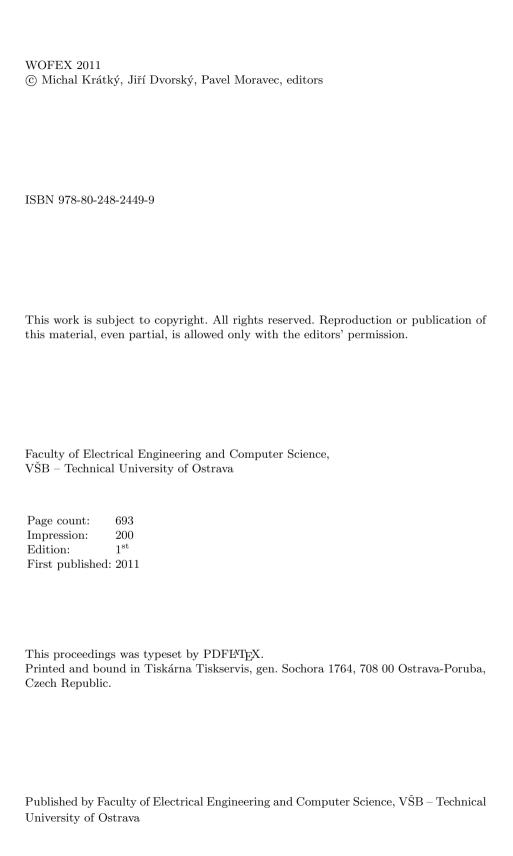Faculty of Electrical Engineering and Computer Science

Preface

The workshop WOFEX 2011 (PhD workshop of Faculty of Electrical Engineering and Computer Science) was held on September 8th – 9th, 2011 at the VŠB – Technical University of Ostrava. The workshop offers an opportunity for students to meet and share their research experiences, to discover commonalities in research and studentship, and to foster a collaborative environment for joint problem solving. PhD students are encouraged to attend in order to ensure a broad, unconfined discussion. In that view, this workshop is intended for students and researchers of this faculty offering opportunities to meet new colleagues.

This book of proceedings includes 110 papers of faculty PhD students and 4 papers of external authors. The proceedings of WOFEX 2011 are also available at WOFEX Web site http://wofex.vsb.cz/2011/. I would like to thank the authors and the Organizing Committee from Department of Computer Science, namely Jiří Dvorský and Pavel Moravec, for their arduous editing work.

September 2011

Michal Krátký
Program Committee Chair
WOFEX 2011

Organization

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Workshop Location:

Campus of VŠB – Technical University of Ostrava
17. listopadu 15, 708 33 Ostrava–Poruba, Czech Republic
8$^{\text{th}}$ – 9$^{\text{th}}$ September 2011

http://wofex.vsb.cz/2011/

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Computer Science (1801V001)

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Communication Technologies (2601V018)

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The Light Spectrum of Obtrusive Light

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Abstract. The world around us is changing faster than we can recognize. Some changes that are directly related to our lives are not even noticed, but some of them are very intensively perceived and we respond to them. If it is somewhere obtrusive light (light pollution), where is it fault? Is it caused by poorly designed lighting system, the current state of the weather or high content of dust particles and aerosols in the air? The first case is the outdoor lighting system as a source of obtrusive light and second one (night sky) only displayed the obtrusive light and it can be disturbing.

Filtering-Compensating Devices at Traction Transformer Stations of the Czech Railways

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Abstract. Generation of harmonic currents towards the power supply network is one of the most relevant influences of AC electric railway operation. A filtering-compensating device aims to alleviate this disturbing effect. The purpose of this paper is to approach the function of this device and assess its benefit on the basis of measured values.

Prototype Detector of Covered Conductor Faults

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Abstract. Lines with bare conductor have rebuilt lines with cover conductor in the Czech Republic. Lines with cover conductor have many advantages. Advantages and disadvantages of PAS system are described here. This paper describes the issue of fault detection for lines with cover conductors and also describes the dependence of partial discharges on fault. The next section provides a design and realization fault detection of cover conductors. This is a prototype which will be tested and optimized. The system will be used for different voltage levels and different types of outdoor lines.

Hydrogen Storage System – Electrolyser Supplied from PV Panels

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Abstract. The fuel cells laboratories at the VSB-TUO have recently finished the realisation of the laboratory energetic system for accumulation of electric power from RES (with varying and unreliable production process). The system comprises of two parts. The first part of the system deals with production hydrogen using the electric power from photovoltaic panels and its storage. The other part of the system uses fuel cells to transform the energy from hydrogen into electric power. The system shall serve for analysis of various methods of accumulation under conditions within the Czech Republic and their utilisation in the insular operation mode.

Simulation of the Electrical Field Between Parallel Plates

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Abstract. Computer simulation has become an essential part of science and engineering. Digital analysis of components, in particular, is important when developing new products or optimizing designs. Today a large number of options for simulation are available. We have available basic programming languages for various levels of implementing advanced methods of simulation. A computer simulation environment is simply a translation of real physical laws into their virtual computer form. We can measure and then process simulated phenomena.

Using the Spectral Analysis in the System of Elimination the Noise by Antiphase

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Abstract. The basic issue of our solution is a noise generated by the transformer operation. If we ignore the constructional intervention into the transformers, we can proceed to the problem with active and passive solution. The passive solution can be covers, rubber silent blocks and elimination due to construction of the building. Our proposed solution for this problem is on active base by sending an identical acoustic signal turned to anti-phase, to the machinery causing an undesirable noise effects. During the optimal setting of this anti-phase there is a conflict of the wave and acoustic shunt fault which should cancel all noise activities expanding by the air during the optimum conditions.

Monitoring Power Quality Parameters in the Ostrava

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Abstract. The monitoring of the quality of electricity distribution network and subsequent compliance with the parameters of power quality in distribution networks is very useful in terms of reducing transmission costs of electricity, followed by transformation, supply to the consumer and the subsequent correct functioning of electrical appliances. The quality of voltage is often reduced electrical appliances connected to the electricity network, as these appliances operate retroactively to the mains. Harmonic voltage distortion caused by the sine wave in the network.

Application of Statistical Methods on Power Lines 110 kV Failure Database

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Abstract. This paper presents a procedure for processing data from database failures 110 kV lines, using the selected statistical methods. The database is analyzed according to the causes of failures. The most common causes of failure include Natural influences (94), and disorders caused by the Operation and maintenance (55). The use of selected statistical methods aims to determine that this group of disorders is within their durations individual failures more significant. As part of this work was necessary to familiarize yourself with the program for statistics - Statgraphics [2].

Automatic Starting of Plasma Furnace

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Abstract. The paper deals with the commissioning of modern concept of the plasma furnace management. At the beginning of paper is illustrated and described solved furnace and its individual parts. The following chapter describes design and realization of proposed plasmatron starting automat. The next chapter describes analysis of real plasma furnace design. Part of this thesis is comparison of new and old power supply, and conclusion, where is summarizing the results of achieved work.

Power Supply of the Electric Traction System and Innovation of the Devices for Testing of the Contact Stress

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Abstract. Work deals with a proposal of eligible power supply of electric trac-tion systems for steel torsion loading diagnostic equipment. With respect to equipment functionality demands it is necessary to project a conception, which allows setting up of wide spectrum of equipment parameters for different types of examined specimens. Project is realised in close cooperation of Department of mechanical engineering and Department of electrical engineering and in-formatics.

Disturbances in AC Traction System

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Abstract. Electric traction is in aspect of electricity consumption great consumer and also a significant source of interference effects that adversely affect the power grid. These effects are especially non-symetricity and higher harmonicss. There is evaluation in this article of measuring alternating current traction system 25 kV, 50 Hz under normal operating conditions at Czech Railways.

Possibility of Using of New Technologies in the Street Lighting

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Abstract. This article assesses the current ways how to reduce energy consumption in public lighting sector. One possible way is using lights with LED technology, which is still in early development, or to continue in using of ordinary sodium lamp fixtures and regulate it.

Heat Pumps, Improvement of Utilisability, Differences in the Calculation of Heat Loss

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Abstract. This article strives towards and summarizes issues of new standard for calculation of heat loss. There are shown results by old and new standard for calculation heat loss and heat demand. Next part describes existing trends and options for accumulation of the heat. It provides explanations for reasons and advantages of accumulation not only for heat pumps, but also describes deals with concepts of heat pumps of smart grid area type and utilisation of accumulation for improvement of effectiveness in running of air/water heat pump.

Evaluation of Cooperation WPP and PV Connected Through the Shared Transformer to the Network 22kV

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Abstract. The article deals with the evaluation of the possibilities of cooperation of wind and solar power plant connected through a shared transformer to the network 22kV. Evaluation of the cooperation is based on measured data for wind power plant with installed capacity of 2 MW and solar power plant with installed capacity of 1.1 MWp. In other parts of the article is an analysis of variations in active power of resources in comparison with the system of WPP + PV In the last part is evaluating the effects after connecting of WPP + PV to the network 22 kV.

Determination of Daylight Illuminance under Uniformly Overcast Sky in order to Reduce Energy Consumption in Buildings

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Abstract. This paper describes modeling of possible savings in lighting systems of artificial lighting, working in combination with daylight. The proposed model works with overcast sky daylight (CIE). Based on knowledge of geographical position, day and time, the calculations are done in the conditions of unshadowed outdoor illuminance levels. From this figure (when daylight factor is known) illuminance caused by daylight can be gain in the different parts of the room. By controlling the artificial lighting (dimming) to constant cumulative value (daylight plus artificial light) in the areas of visual tasks, then it is possible to determine potential of savings in areas with controlled lighting system and without it. According to this model (calculation), we can consider a suitability of the dimmable lighting systems in the specific work areas and make recommendations to reduce energy requirements of buildings in energy audits.

Optimizing Power Flow in the Smart Region

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Abstract. Efforts to maximize use of electric power from renewable sources necessarily leads to change the current conception of electrical distribution networks. This requires knowledge of the behavior of existing distribution network. For this purpose, the Department of Electrical Power developed the Dynamic Model.

Higher Current Harmonics on the Level 27 kV Caused by Traction Transport

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Abstract. Electrical circuits are active in two main voltage systems. The first one and from the point of EMC view incident-free one is direct current system 3 kV. The second one is alternating system 25 kV, 50 Hz, that shows unfavourable effects in the field of asymmetry and higher current harmonics. Spectrum disturbing frequency components in the reverse traction current are dependent on power system, traction power station (TPS) and driving vehicle, this means on the type of traction engine and the way of his regulation.

Effect on Power Quality of the Power Electric Railway Traction

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Abstract. This paper presents a systematic approach to estimate effect of harmonic in AC electric railways, which incorporates a novel directional track shift method to deal with the train. On the basis of the united model, the transfer characteristics of harmonic currents and voltages are simulated and harmonic distortion is calculated while the locomotive is situated at different positions. The railway simulation is performed in the ATP version of the Electromagnetic Transient Program (EMTP) and the results of the harmonic simulation are compared for different positions of locomotive on a railway system.

Heat Pumps for Heating Aula at VŠB - TU Ostrava – Evaluation of This Year's Heating Season

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Abstract. The article deals with assessment of the heating season 2010/2011 using heat pumps at the Assembly Hall of VŠB - Technical University of Ostrava. Heating within the newly built Assembly Hall building involves 10 heat pumps manufactured by the IVT company from Sweden with the total output of 700 kW. The source of low-potential heat is ensured with the system of 110 boreholes down to the depth of 140 m. The bivalent, i.e. auxiliary, source is represented by the interchanger station within the central heating supply. The heat loss of this Assembly Hall - the heating output required to maintain the Assembly Hall with the necessary environmental temperature, with the ambient air temperature of $-15°$C, is equal to approximately 1,200 kW.

Optimalisation Shape of the Air Gap of Mantle Electromagnet for Industry Application

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Abstract. The article deals with finding an optimal shape of the air gap of the mantle cylindrical electromagnet. To find it finite element method was used, which is used by COMSOL program. This program is used to find the optimal solution.

Programming Vector Control for AC Induction Motor with DSC TMS320F28335

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Abstract. In this paper, there is a description of programming Vector Control for AC Induction Motor used Digital Signal Controller TMS320F28335. It is a description of Vector Control and its result used motor with test stand. Here is a description of used hardware, drive and procedure for conceiving software for Vector Control.

Experimental Workplace for Teaching of Modern Control Algorithms Controlled AC Drives

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Abstract. This paper attempts to describe an experimental workplace for designing of new control algorithms for electric regulated drives with induction motors. Laid out in few chapters, a reader is gradually introduced to the hardware to design these algorithms. First two chapters deals about a description of a microprocessor and starter kit from Texas Instruments. In other chapters there are description of indirect frequency converter, an incremental position sensor and support board for starter kit. In conclusion, there are final designs of the laboratory workplace.

Simulation of Sensorless Vector Control of Induction Motor Using HIL Method

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Abstract. This work deals with simulation of sensorless vector control of induction motor using HIL method in Matlab-Simulink. The text in the first part deals with the description of vector control with the structure MRAS. The second part describes HIL method and then multifunction card MF 624. In the last section of this document are shown simulation results for changes engine speed from 0 to 500 rpm, respectively, from 500 to -500 rpm.

Magnetic Properties of Types of Core for Toroidal Transformers Made from Thin Low-Loss Sheets and Thermal Influence on Resulting Transformer Idle Current

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Abstract. The paper presents the results of independent experimental analysis aimed at determining the magnetic properties of the selected type of toroidal transformer cores made from thin silicone alloyed sheets with a low loss number used in our case in the manufacture of toroidal transformers for higher class audio power amplifiers. Another part of the paper deals with the results of the experimental analysis aimed at determining the effect of temperature on size and type parameters of the current loading of small toroidal and conventional transformers. The aim of this measure was to assess the effect of temperature and voltage values at no load current of the selected type of toroidal and conventional transformers put in a climatic chamber. Furthermore, our attention was drawn to the observations of the effect of temperature and magnetic saturation on voltage transformer cores and to approximate formulation of magnetic properties of metal core type transformers in the form of BH hysteresis characteristics.

The samples were analysed and the waveforms U_{10}, I_{10}, U_{20} were measured and recorded. The measured values were then used for calculation of additional quantities of toroidal transformers (magnetic flux density, magnetic field intensity) that specify the magnetic properties of the measured samples. Finally, the measured results of both the toroidal and conventional transformers were compared.

The temporal analyses of saturation of cores are the outcome of extensive and time-consuming measurements and registration of signals in no-load state for various levels of supply voltage. The measurements were based on common knowledge of the properties of soft ferromagnetic materials.

Summary of Fractional Order Operators Approximations and Simulation of Selected Methods

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Abstract. There are situations when technological process needs to work at low or almost zero speed. This causes problems with regulation because the measured signal changes very slowly. Because of this effect the demands on e.g. speed controller accuracy are more highly. Many different methods, how to solve this problem have been analyzed with various results. Heretofore little notice was taken of fractional calculus application. It was caused, among others, by problems with practical realization because the approximation processes brings considerable computing demands. The main aim of this paper is to compare and in time and frequency domain analyze possible models and approximations of fractional order controllers. From large number of different approaches only selected integer order continuous approximations were discussed.

The Design of an Axial Flux Rotary Converter for Hybrid Electric Vehicles

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Abstract. This paper describes an efficient axial flux arrangement of the four quadrant rotary converter for hybrid electric vehicles. Further design of the axial flux stator and double rotor machine appears from the radial air gap induction motor and permanent magnet synchronous motor, utilizing the method of constant magnetic circuit volume for dimensions conversion.

2D Simulation of Electromagnetic Field Distribution in the Type Electron Microscope

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Abstract. The paper deals with 2D computer simulation of electromagnetic field distribution in the real type electron microscope with respect to real magnetic properties of steel and other ferromagnetic materials obtained from measurements. The computations were solved by finite element method using ANSYS software. This project and paper were created by financial support of state budget through the Ministry of Industry and Trade MPO-CR, project n. FR-TI1/334.

Control Unit for Parallel Active Power Filter

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Abstract. This paper describes the basic principle of parallel active power filter and gives a basic description of its control unit based on kit eZdspTM F28335. For this application was necessary to develop Interface-board, which provides correct adaptations of input and output signals for eZdspTM F28335. The following is a brief description of Code Composer Studio v4 which is an integrated development environment for Texas Instruments DSP and MCU devices.

Real-time Estimation of Induction Motor Parameters Based on the Genetic Algorithms

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Abstract. This article shows one of many ways how to identify the parameters of the IM in real time. There is used the theory of genetic algorithms for IM parameters identification. The introduction describes why the problem is discussed. Next chapters show induction motors dynamic model and the principle and way how to implement the IM parameters identification. Theory of used genetic algorithm and experimental results are demonstrated in the end of this article. The conclusion describes the potential use of this method and discusses further developments in the real time estimation of induction motors parameters.

Sensor Control Simulation of Switched Reluctance Motor Using HIL Method

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Abstract. This work deals with simulation of sensor control switched reluctance motor using a HIL metod. Area of this method is very wide. Using this method is in aviation, military, automotive etc., ie wherever is a complex control systems. HIL simulation method extends the classical simulation to simulation, where control is represented by the real control system and the simulation is close to the real world. Controlled system is a simulation model of SRM, which was created in Matlab-Simulink and therefore we can simulate error conditions, which we could not test on a real machine. HIL test method in this work is performed by the multifunction card MF 624, which connects the electronic device and the simulation model of the controlled system.

Control Methods of Series Active Power Filters

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Abstract. Active filters are very important to mitigate harmonic pollution due to the widely used nonlinear loads both in home appliances and in industry, therefore are mentioned in Introduction. However, main focus is devoted to se-ries active power filter (SAPF), with a focus on the control methods. Finally, simulation of SAPF is shown to understand its function.

Electric Vehicle Control Units

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Abstract. This paper deals with an implementation of control units in the pure Electric vehicle, which has two independent voltage inverters and induction motors. The unit is equipped with Freescale DSC 56F8037. Each control unit drive own inverter and motor with using vector control algorithm with conception of current model. Computing structures from Freescale's motor control library are used in this algorithm with combination of fractional numbers implementation. Important part of whole system is data interchange between units, which is solved by CAN bus.

Identification of Selected Parameters of Synchronous Machines with PM for the Purpose of Optimizing

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Abstract. This paper shows identification procedure selected parameters of synchronous machines with permanent magnet for optimization purposes. There is shown the steps of identification by analytical calculation, measurement, and also using the finite element method. There is also analysis of the magnetic induction in the air gap using FEM.

Implementation of the Injection Method to Control Structure

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Abstract. This paper describes the simulation procedure of sensorless control of induction machine using injection of high-frequency voltage signal. In several chapters, the description and design simulation control method is gradually introduced to a reader. The first two chapters deal with formation and classification of injection methods. Remaining chapters describe sensorless control with high-frequency signal injection method.

Interconnection of DSC TMS320F28335 and PROFIBUS

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Abstract. This article deals with the PROFIBUS communication and its possibilities of connection to the DSC TMS320F28335. At first is presented the ISO/OSI model, subsequently is analyzed the basic properties of the PROFIBUS including the most often used applications. Then is explained the principle and communication settings for DSC TMS320F28335 through the SCI interface. At the end of this article is outlined possible hardware implementation. It consists mainly in adapting the appropriate voltage levels for connection to the PROFIBUS fieldbus. In practice is most often used for this purpose as a transmitter integrated circuit from one of a number of manufactures.

Novel Wien Bridge Oscillator Design Using Functional Block Structure with Current Conveyors

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Abstract. The purpose of this paper is to generally present possibilities of the current conveyor use in the well-known active electronic circuits. Current conveyors are able to substitute all known active elements. This claim is supported by the fact, that four basic functional block structures can be realized by use of current conveyors – voltage-controlled voltage source, voltagecontrolled current source, current-controlled current source and currentcontrolled voltage source. The paper presents particular example of use of functional block structure with current conveyors in Wien bridge oscillator, where it successfully substitutes operational amplifier on the place of active element. Both theoretical formulae and design description are given. Finally, OrCAD PSpice simulation results are presented.

Digital Filter Implementation to DSP Systems

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Abstract. This paper deals with a comparison of digital and analog filters and digital filter implementation to DSP. In this paper is also solved design of digital filters, their behavior and their applications. Digital filters are investigated in simulations as well as implemented in DSP. For DSP there is a time of execution studied.

Simulation of Power Dissipation in the Indirect Frequency Converters

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Abstract. The article deals with the simulation of indirect frequency converter. The frequency converter consists of a rectifier, where is the input current and voltage rectified. The voltage is adjusted to desired values by the inverter. Input and output circuits are isolated dc-link. In the created simulations are used calculations of effective and mean currents. These currents are load for the transistors and diodes three-phase inverter. By applying a special mathematical apparatus can be determined the loss in the inverter which are caused the current conduct and switching losses.

Monitoring the Status of Accumulator Battery Cells

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Abstract. This article describes possible ways of monitoring the status of accumulator batteries not only in their operations. Monitoring device with a microprocessor to easily carry out various data collection, processing and subsequent use results to inform, monitor or control other devices. Communications of the measured data from the battery is galvanic separated and sent to the control center.

Remote Controlled Instruments Simulators for Educational Purpose

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Abstract. When working with the remote-controlled device measuring instrument it is beneficial to use the drivers that are created according to the standard SCPI and VXI plug and play. These instrument drivers largely simplify and speed up the work in developing applications for measuring devices. At the end, the work gives a closer look on a simulator that is used for teaching remote control devices. There are described various devices that a simulator contains, and mentioned some of their features.

Tester for Phasor Measurement Unit Testing

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Abstract. Phasor Measurement Unit (PMU) is used for the evaluation of synchronous phasor. The IEEEC37.118 standard describes features of the PMU. This document is focused on communication description with PMU and PMU measurement accuracy in steady state. Detailed description of the implementation of phasor evaluation in the international standard form does not exist.

Optimization of Takagi-Sugeno Type Fuzzy Regulator Parameters by Genetic Algorithm

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Abstract. Many papers deals with the usage of fuzzy rules to implement PID type control. Fuzzy models, especially the Takagi-Sugeno-type, have received significant attention from various fields of interest. It is very often very difficult to determine all the parameters of the Takagi-Sugeno-type controller. In this paper we present optimization of Takagi-Sugeno-type fuzzy regulator parameters by genetic algorithm. Implementation of universal fuzzy P/PS/PD function block implemented to the PLC Simatic S7 300/400 is introduced. Mamdani model is used as comparative model. Parameters of Takagi-Sugeno-type fuzzy regulator are determined by genetic algorithm optimization from comparative regulation surface.

User Perspective Adaptation Enhancement using Autonomous Mobile Devices

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Abstract. The need for devices with the ability to detect toxic gases, trapped people and to multifunction has increased. Dangerous places and armed conflicts have increased the demand for remote and autonomous devices. We propose a concept of two such devices with the ability to comfortably and remotely control such devices and even with an autonomous control in remote areas inside the buildings. The localization by WiFi is used to locate a position where the GPS signal is not well presented. The ability to locate a mobile device by a wireless network is a well known possibility. The current problem is precise indoor localization where WiFi signal from the building infrastructure is not strong enough to obtain right position.

Use of Mobile Phone as Intelligent Sensor for Sound Input Analysis and Sleep State Detection

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Abstract. A sleep itself is not just a passive process. Throughout the night a specific number of sleep stages take place. Sleeping is a strongly dynamic process that is terminated by waking up. A sleep consists of number of stages that are repeatedly changing in various periods of time. This specific time inter-val and specific sleep stage are very important in the wake up event. If we wake up during the deep NREM (2-4) stage of a sleep it is far more difficult to wake up because the rest of the body is still sleeping. On the other hand if we wake up during the mild (REM, NREM1) sleep stage it is much more pleasant for us and for our body. This problem led the authors to create this study and as well as a Windows Mobile based devices application called wakeNsmile. The wakeNsmile application records and monitors the sleep stage for specific amount of time before desired alarm time set by users. It uses with a built-in micro-phone and determines optimal time to wake the user up. Hence, if the user sets an alarm in wakeNsmile to 7:00 and wakeNsmile detects that a more appropriate time to wake up (REM stage) is at 6:50, the alarm will start at 6:50. Current availability and low price of mobile devices is yet another reason to use and develop such an application that will hopefully help someone to wakeNsmile in the morning.

Phasor Measurement Units and Phasor Data Concentrators Data Evaluation on Virtual Instrumentation Concept

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Abstract. The article deals with PMU data processing using Lab-VIEW. PMU provides continuous data stream according IEEE C37.118. For the purpose of PMU testing has been developed application which receives data from several PMUs, provides time correlation of received datagrams and saves synchrophasor data. When precise time synchronized source of voltage and current signal is used as common source for all PMUs, then developed software can be used for PMU test evaluation.

A New Method of Precise Fundamental Frequency Estimation from DFT Spectrum

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Abstract. This paper explores the possibility how to implement a frequency estimator based on a new principle. It takes advantage of the spectral leakage effect of the discrete Fourier transform. The proposed method is extended to identify the fundamental frequency. The method is then tested on simulated signals and compared with other methods.

Automated Testing of Measurement Instruments

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Abstract. In these days the term power quality becomes to be significant in industry. Many manufacturers develop equipment for measuring the quality of electrical energy for various applications. However, the qualitative requirements for the operation of these devices are still not precisely defined. So it is not an exception that different manufacturers differently interpret requirements. Then it is more difficult to compare qualitative parameters of these different devices. This paper describes how to test functionality and capability of devices for measuring power quality.

Visual and RFID Checkout Inspection System

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Abstract. This contribution discusses possibilities of implementation visual inspection and RFID techniques into labeling technology of blood container due demand of increasing process automation level in transfusion center. At the current development of the imaging equipment and computer vision, especially given the reduction of cost can be effectively used for technologies demanding of industrial processes of visual inspection. Another benefit of the application this processes is the possibility of achievement more safety in the handling of biological material in these critical applications. Also in the introduction of the RFID technologies enables automatic matching and verification of the RFID tags and bar codes. This also leads to improved safety especially at the time when all workplace are still not equipped with the RFID readers and therefore are still just using bar codes readers. Currently in cooperation with the Blood center of University Hospital in Ostrava are tested technology possibilities of both the labeling system and their reciprocal compatibility. Detailed description of visual inspection of blood containers label, matching with RFID tags and inspection of the integrity of the container is in the following text.

Integration of REPACE Central Registry, DASH and ICS 3000 Devices with Hospital Information System

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Abstract. Paper describes the system that is developed by the authors and which allows connection of HIS (Hospital Information System) used at Městská nemocnice Ostrava, REPACE central registry of pacemaker implantations, vital signs monitor DASH and implant control system ICS 3000. This connection allows users to effectively create, store and visualize operation reports. The new system is being developed using C# programming language within .NET environment. The developed application's title is ImplantSys.

Using Mathematical Modelling of Temperature Conditions inside Geothermal Resources

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Abstract. This paper deals with some usage of mathematical apparatus for modelling of temperature conditions inside geothermal resources – in this case, we are interested in low-temperature ones in the forms of research polygons and rocks, whereas it is required to consider lots of factors, describing this problem correctly by using relevant mathematical formulas and equations, based on famous Fourier partial differential equation and other empirically developed equations. Using some sophisticated software applications, it is possible to evaluate the acquired data, whereas there is mentioned software application of EED only. Its borehole design process, including practical example, focused on approximate calculations of borehole length, depth, and number.

Method of Robot Motion Control using Cubic Hermite Splines

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Abstract. This paper presents the results of motion control method for wheeled robots that utilizes cubic Hermite splines for path planning. The method is designed to allow computation and recomputation of robot trajectory in real-time using the current computer technology. In the first part, the main components of the system are described including the Kalman filter facilitating the filtering and prediction of the robot position, the trajectory planner based on Hermite splines and the feedback and feedforward controller controlling the movement along the calculated trajectory. In the experimental part of the paper, the calculated trajectories and its velocity profiles are compared with the measured ones on the test bed. The experiment was carried on with sampling rate 100 cycles per second.

Using Concept Lattices in Publications' Classification Analysis

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Abstract. The definitive classification of scientific journals depends on their aims and scopes details. In this paper, we present an approach to facilitate the journals classification of the DBLP datasets. For the analysis, the DBLP data sets were preprocessed by assigning each journal attributes defined by its topics and then the theory of formal concept analysis is introduced. It is subsequently shown how this theory can be applied to analyze the relations between journals and the extracted topics from their aims and scopes. The result is a concept lattice that contains information on journal-topic relational context depending on how they are associated.

Use of Neural Networks in Recognition of Weather Impact on Radio Signal

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Abstract. This paper deals with using a neural network in field of recognition weather impacts on a telecommunication network. In this work was gathered data from a meteorological service from VŠB-Technical University of Ostrava, GSM signal. Analysis with strong focus on inter-correlations was done for the data. For this purpose was studied and used theory of multilayer perceptron network with back propagation algorithm for clustering.

Classification Methods for Brain-Computer Interface

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Abstract. The performance of four classifiers for Brain Computer Interface (BCI) systems based on multichannel EEG recordings is tested in this work. The classifiers are designed to distinguish EEG patterns corresponding to performance of several mental tasks. It is shown that relatively simple classifiers based on the Bayesian approach are comparable in classification accuracy with more sophisticated classifiers based on Common Spatial Patterns and Common Tensor Discriminant Analysis.

Generating Parallel Applications from Models Based on Petri Nets

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Abstract. This paper briefly describes the tool intended for modelling, simulation and generation of parallel applications. A developer is able to model parallel programs and different aspects of communication using Kaira. The used model is based on the variant of Coloured Petri Nets. Our tool can automatically generate standalone parallel applications from models. The parallelism of a final application is currently based on threads or MPI.

Using LLVM for a Functional Programming Language Implementation*

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Abstract. This paper outlines the possibilities which LLVM (Low Level Virtual Machine) framework offers to implementors of functional programming languages. First, the LLVM is briefly introduced. Then its use is demonstrated on implementation of a simple functional programming language named Tiny. Our primary goal is to implement the $\mathcal{T}IL$-`Script` functional programming language that is a computational variant of Transparent Intensional Logic (TIL). We outline the main principles of its implementation using the LLVM framework.

Using Kohonen Maps and Singular Value Decomposition for Plagiarism Detection

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Abstract. Plagiarism has become one area of interest for researchers due to its importance, and its fast growing rates. Effective clustering methods and faster search tools for matching and discovering the similarities between documents were the main two areas for the researchers. Many tools and techniques have been developed for plagiarism detection. In this paper we use singular value decomposition for its effective clustering of the documents in-order to reduce search time by creating a new matrix with fewer dimensions used for clustering the original (source) documents, and we use Neural Networks for local matching and comparison between a suspicious document and a source document, Kohonen maps used to visualized and comparison of the result, in which represent the result as picture that easier to be analyzed.

Iris Segmentation in Eye Image

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Abstract. In this paper we present our previously published work on iris segmentation. The iris extraction algorithm described here is based on our observation of local brightness properties of close-up iris images. Our algorithm consists of three simple steps. We detect the bright point inside the pupil, outer limbic boundary is found via statistical measurements of outer boundary points and inner boundary points are searched by means of defined cost function maximization. Performance of the presented method is evaluated on series of iris images and compared with the traditional Hough method as well.

Understanding the Context of Statements in Transparent Intensional Logic

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Abstract. This paper concerns with intensional and extensional interpretation of statements (de dicto and de re) as taken in Transparent Intensional Logic (TIL). It provides a brief introduction to the language of TIL, its concept of typing and the way of formalizing statements. The whole described concept is illustrated on the example. It provides a basic description of TIL's anticontextualism.

Watershed Inspired Heat Flooding Segmentation

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Abstract. In this paper, we introduce a new image segmentation approach based on the diffusion (heat flooding) equation inspired by watershed transformation. Flooding by water from the watershed segmentation is replaced by flooding of the heat. The main improvement of this method is that we are using a local minima as a starting point for the heat distribution through the image. It also takes the size of segments in account and that leads to further reduction of over-segmentation which is a main problem of watershed segmentation. In this paper we present our method, and show some segmentation results.

Diffusion Spectral Clustering for Image Segmentation

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Abstract. In this paper, we present a new image segmentation method coming from the idea of spectral clustering. Contrary to the known algorithms in this area, it uses the process that we call diffusion spectral clustering in which the standard spectral clustering based on the spectral decomposition of the Laplacian matrix is improved by incorporating the diffusion process. For clustering itself, the mean shift algorithm is used instead of the k-means algorithm that is usually mentioned in this context. Both the diffusion process as well the as the mean shift algorithm contribute to the good properties of the new method. In the paper, the needed theory and the results of experiments are presented.

Extension of Method for Fuzzy Rules Extraction by Means of Artificial Neural Networks

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Abstract. Knowledge extraction from data in the form of rules is a widespread direction in data mining area which allows to obtain interesting relationships in data from large databases in for a human easily understandable form. In this article I deal with one of the methods for extraction of rules from data which extract rules in form of a formula in considered fuzzy logic by means of artificial neural networks with very special architecture. Using artificial neural networks in extraction process, above mentioned methods gain good approximation of the analyzed data and also thanks to special architecture allows to extract well human-understandable knowledge. In the method described in this paper was, however, missing any module that is a standard part of the most of methods used for rules extraction from data, that would allow to the user subjective selection of the best ratio between accuracy and comprehensibility of the model, which is especially important feature for solving data mining tasks called *searching of concepts descriptions*, which methods allow the user to get a good insight and understanding of the analyzed data. Thus, the main purpose of this article is a design of such a module inspired by a similar module in methods for extraction of the so-called *decision trees* and subsequent illustrations and evaluations of the results obtained by the original method, extended by a new module on sample dataset.

Using of SVD and NMF in Social Networks

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Abstract. The aim of this work is to make use of the singular value decomposition method (SVD) for reduction of social network graphs. This method is plentifully used for issues where is the dimension reduction requirement such as an image compression or searching in document collections. The other aim is to use a method of nonnegative matrix factorization (NMF) which is used for dimension reduction as well. We want to compare these methods SVD and NMF from point of view of graph reduction and better identification of significant authors in large graphs.

Computers and the Handicaped

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Abstract. In the context of this article is to meet the skilled public with the work of the handicapped on the computers. The handicapped use computers to work They use it for the fun. They need to adapt a mouse or keyboard to the comfortable control. They need to adjust websites for simpler use, too.

Lossless R-tree Compression using Variable-Length Codes

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Abstract. The R-tree is one of the most popular multidimensional data structure. This data structure bounds spatially near points in multidimensional rectangles and supports various types of queries, e.g. point and range queries. When a compression of the data structure is considered, we follow two objectives. The first objective is a smaller index file and the second one is a reduction of the query processing time. In this paper, we introduce a lossless R-tree compression using variable-length codes. Although variable-length codes are well known in the area of data compression, they have not been yet successfully applied in the case of the data structure compression. The main reasons of this fact are inefficient decoding/encoding algorithms. In this paper, we apply recently introduced fast decoding algorithms and we show that these codes save up-to 84% of the index file's size compared to the uncompressed R-tree and provide more efficient query processing time.

Vienna Development Method

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Abstract. This article deals with Vienna Development Method. The primary goal of this article is to give a first introduction on VDM to the reader. First, we will introduce the VDM, further we will describe the origins of the VDM. In the third chapter is described structure of VDM and modules. Using of the VDM is in the last section.

Unsupervised Algorithm for Segmenting Categorical Time Series

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Abstract. This article discusses the possible use of Voting Experts algorithm as one of the tools for "Retrieve" part of Case-Based Reasoning (CBR) methodology. The Voting Expert Algorithm is a domain-independent unsupervised algorithm for segmenting categorical time series into the meaningful episodes.

Formal Methods in Software Process Modeling

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Abstract. Documented software processes and their assessments are the basics of modern software development. Currently the semantic web, knowledge bases and knowledge management have many applications. Yet, applications to support software processes (and business processes in general) are surprisingly being ignored. In this paper we focus on conclusions done in research that focus on applying a knowledge layer into software processes and on the design of such a knowledge base. We will recap proposal of set of methods for building semantic annotations for software processes and an improvement based on the application of a machine readable knowledge base based on such ontology.

Quaternions and Molecular Dynamics of Rigid Bodies

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Abstract. In this paper we are going to introduce the system of quaternions which extends the complex numbers. In the first part we will show basic properties of quaternions with a main focus on their product in relation to three dimensional rotation. In the second part we will show their using in molecular simulation of rigid bodies. This approach leads to less memory demands and gets rid of singularities compared to the Euler angles.

Application of Multidimensional Data Structures to Indexing XML Data

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Abstract. Holistic approaches are considered as the most robust solution for processing of twig pattern queries requiring no complicated query optimization. Holistic approaches use an abstract data type called a stream which is an ordered set of XML nodes with the same schema node. A straightforward implementation of a stream is a paged array. In this article, we introduce a multidimensional implementation of the stream for path labeling schemes. We also show that this implementation can be extended in such a way that it supports fast searching of nodes with a content. Although many multidimensional data structures have been introduced in recent years, we show that it is necessary to combine two variants of the R-tree (Ordered R-tree and Signature R-tree) for an efficient implementation the stream ADT.

Multi-Agent Systems and Transparent Intesional Logic

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Abstract. In this paper, we focus on the concept of time from the perspective of an agent in a Multi-Agent Systems. We propose a method of modelling dynamic behaviour of these systems using Transparent Intensional Logic. We also describe several issues where the formalization affects the implementation of both the system and the agents, and propose solutions to the problems that may arise.

TIL and Ontology Specification

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Abstract. In this paper we introduce Transparent Intensional Logic (TIL) as a tool apt for the specification of ontologies and knowledge representation. Ontology is characterized as the result of conceptualization of the domain under scrutiny. We specify the structure and content of ontology and the notion of ontology is distinguished from the notion of conceptual analysis. We show that TIL can serve as a highly expressive universal framework that makes it possible to rigorously specify the content of ontology and respective knowledge base, including the relations between particular concepts.

A Note on Realization of A Multi Camera Railway Crossing Safety System

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Abstract. Increasingly we witness the accidents, causing not only incalculable damage to railway electrification and security systems, but also losses of lives. The train, derailed at high speed, can destroy great area of those systems, and paralyze the traffic for tens or hundreds hours. An obstacle, that prevents free passage trough the hazardous area, could be the source of such an accident. Cameras are suitable for monitoring such areas and recording them for a long period of time, but in combination with a suitable computer vision algorithm, it can completely autonomously inform us about extraordinary situations. In this paper we examine the problem of monitoring the critical areas using multiple cameras and combination of camera images to obtain large enough precision to determine hazard level of the situation in the secured area. Furthermore, we show an example of possible use of the system in practice and in the end we discuss the results of our work.

Using Social Network Analysis Metrics to Study Elearning Collaboration

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Abstract. Many organizations are forming virtual teams of geographically distributed knowledge members to collaborate on a variety of tasks. But how effective are these virtual teams compared to traditional face-to-face groups? This paper describes a study about two networks. The first is an explicit network of a consulting company employee, and the second is an implicit elearning network. The main objective is to find a quality knowledge and trustworthy collaborators based on methods of social network analysis.

Expectation-Maximization Method for Boolean Factor Analysis

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Abstract. Boolean factor analysis is one of the most efficient methods
to reveal and to overcome informational redundancy of high-dimensional
binary signals. In the present study, we introduce new Expectation-
Maximization method which maximizes the likelihood of Boolean Factor
Analysis solution. Using the so-called bars problem benchmark [2], we
compare efficiencies of the proposed method with Dendritic Inhibition
neural network [7].

Bayesian Spam Filtering and Normalized Compression Distance

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Abstract. Unsolicited or undesired email messages (i.n. spam) has become a major problem lately. One of the major obstacles is to decrease a rate of false reports, detected in incoming email. This work concerns additional comparison of incoming email with previously reported spam messages. To achieve this goal the normalized compression distance was used, which further contributed to the decrement of rate of false reports.

Semi-Smooth Newton Method for 2D Contact Problems with Tresca and Coulomb Friction

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Abstract. The contribution deals with contact problems for two elastic bodies with friction. After the description of the problem we present its discretization based on linear or bilinear finite elements. The semi–smooth Newton method is used to find the solution. We present active sets algorithms. The non-symmetric and symmetric case is distinguished with using BiCGSTAB and CGM, respectively. Finally we will arrive at the globally convergent dual implementation of the algorithm.

Using Support Vector Machines in IDS Systems

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Abstract. Intrusion Detection System (IDS) is a system, that monitors network traffic and tries to detect suspicious activity. In this paper we discuss the possibilities of application of Support Vector Machines (SVM) for use in the IDS. There we used SVM as classification SVM of type 1, known too as C-SVM. By appropriate choosing of kernel and SVM parameters we achieved improvements in detection of intrusion to system. Finally, we experimentally verified the efficiency of applied algorithms in IDS.

Robust library for Robot Soccer Game

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Abstract. Robot Soccer is a very attractive platform in terms of research. It contains a number of challenges in the areas of robot control, artificial intelli-gence and image analysis. This article presents a look at the overall architecture of the game and describes some results of our experiments, mainly in analysis and optimization of strategies.

Quality Measuring of Segmentation Evaluation Methods

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Abstract. Image processing can consists of segmentation. It could be performed by a human or an algorithm. In both cases, results can be evaluated by different methods. Such evaluation compares two segmentations, typically. This could serve for evaluation of quality of current segmentation or whole algorithm. Still, the results are based on one of many evaluation methods. Poor quality of evaluation method will lead to misleading results of quality of the segmentation algorithm. Therefore, evaluation methods should be also evaluated. Following article will present some evaluation methods, evaluation methodology and a data set. Results will show the quality of each evaluation method.

Hierarchical Acceleration of Mean-Shift Segmentation Methods

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Abstract. The Mean-Shift segmentation method is very popular for its good segmentation and filtration results. Many variations of Mean-Shift methods appeared in the last years in order to improve segmentation quality and, especially, the speed. In this paper, a hierarchical approach to the Mean-Shift segmentation is discussed. We present our methods called Hierarchical Blurring Mean-Shift and Hierarchical Evolving Mean-Shift.

Learning Styles in Adaptive Teaching

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Abstract. In adaptive e-learning we try to make learning more efficient by adapting the process of learning to students' individual needs. To make this adaptation possible, we need to know key students characteristics – his motivation, group learning preferences, sensual type and various learning styles. One of the easiest ways to measure these characteristics is to use questionnaires. New questionnaire was created because there was no questionnaire to measure all these characteristics at once. This questionnaire was filled by 500 students from different fields of study. These results were analyzed using clustering, decision tree and principal component analysis. Several interesting dependencies between students' properties were discovered using this analysis.

Parallel SOM Learning

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Abstract. The paper is oriented to the problem of clustering for large datasets with high-dimensions. Based on the learning phase using artificial neural network, especially Self organizing map, which we find as a suitable method for the reduction of the problem complexity. Due to the fact, that the learning phase of artificial neural networks can be time-consuming operation (especially for large high-dimensional datasets), we decided to accelerate this phase using parallelization to improve the computational efficiency.

Communicating Sequential Processes

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Abstract. This article deals with issues of communication sequential processes. The first part is devoted to the process algebra in general. Further in text language of CSP is described in more details. This article is focused on familiarization with the structure of language of CSP, such as sequential communication, recursion, selection, parallel communication, hiding, renaming, and behavioral processes. There is described the usage of behavioral diagrams for visual record of CSP language in the last section.

IP Nearshoring: Questionnaire Analysis of Software Quality Improvement in Nearshoring Context

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Abstract. This paper summarises results of the trial academic IP Nearshoring Project and it extends previous papers which introduce and present first outcomes. As long as project lasted for 3 years, challenge of comparing final results has arisen. Discussion about issues influencing nearshoring software services is the main concern of our investigation. Questions we wanted to be answered were extracted from participants' feedback data and questionnaires. Results are affected by real factors teams had to face. Project also involved issues such as a different technical background, cultural differences, various attitudes, communication and linguistic skills.

Fast Encoding and Decoding Algorithms for Variable-length Codes

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Abstract. Data compression has been widely applied in many data processing areas. Compression methods utilize variable-length codes with the shorter codes assigned to symbols or groups of symbols that appear in the data frequently. Fibonacci, Elias-delta, and Elias-Fibonacci codes are representatives of these codes, and are often utilized for the compression of numbers. Time consumption of encoding as well as decoding algorithms is important for some applications in the data processing area. In this case, efficiency of these algorithms is extremely important. Fast encoding and decoding algorithms Fibonacci, Elias-delta, and Elias-Fibonacci codes are presented in this paper. Our approach is up-to 7.9× more efficient than the conventional bit-oriented algorithms.

Optimization of Strategies Set
in Robot Soccer Game

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Abstract. The robot soccer game is full of challenging in the field of robot and artificial intelligence. Strategy is a kernel subsystem of robot soccer game. In our work, we propose a ranking model of strategies, based on which we can detect hub strategy and solve its problem. Additionally, we also present a method to generate offensive strategies. The experiment that eliminates the impact of external factors at mostly shows the effectiveness of strategic description and validity of our method.

Efficient TFETI Based Solver for Elasto-plastic Problems of Mechanics

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Abstract. This paper illustrates how to implement effectively solvers for elasto-plastic problems. We consider the time step problems formulated by nonlinear variational equations in terms of displacements. To treat nonlinearity and nonsmoothnes we use semismooth Newton method. In each Newton iteration we have to solve linear system of algebraic equations and for its numerical solution we use TFETI algorithm. In our benchmark we demonstrate our approach on von Mises plasticity with isotropic hardening and use return mapping concept.

Parallelization Strategies of the Total FETI Coarse Space Projector

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Abstract. This paper deals with discussion of several variants of parallelization of the projections to the natural coarse space in the TFETI algorithm. A 2D elasticity benchmark was implemented using PETSc parallelization library and scalability was demonstrated up to 201 mil. of unknowns and 3072 cores.

Numerical Experiments with Gradient Based Methods for Calibration of a Heat Conduction Models

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Abstract. The paper provides a numerical experiments with techniques suitable for calibration of a heat conduction or similar models based on PDE and discretized by the FE method. Especially, an application of gradient based optimization methods is discussed. A special model problem, originated from rock mechanics, is used for comparison of the solution methods.

Survival Analysis: Comparison of Two Different Surgery Techniques for Minimization of Postoperative Complications

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Abstract. This paper deals with evaluation of medical survival censored data of 844 patients, who underwent surgery of colon and rectum cancer in the University Hospital of Ostrava. There are used two different surgery techniques for this operation: either classical (open) or laparoscopic. Basic question which arises generally at surgeries with several possible techniques is which type of operation to choose to guarantee longer overall survival time. For the comparison was used the nonparametric approach which results from Kaplan- Meier estimates of the survival function. The survival curve was constructed for each group of patients, i.e. for classical (open) and laparoscopic type of operation. Final survival curves were compared and evaluated using advanced methods of statistical inference, as is hypothesis testing (e.g. log-rank test).

Automated Region of Interest Retrieval in Metallographic Images in Matlab with Application to Quality Scoring

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Abstract. The aim of the research is development and testing of new methods to assess the quality of digital metallographic images introduced in the quality of steel with high added value. In this paper, we will address the development of methods to assess the quality of metallographic samples, including slabs with the main emphasis on the quality of the image center. For this reason, we introduce an alternative method for automated region of interest retrieval. In the first step, the metallographic image is segmented using both spectral method and thresholding. Then, the extracted macrostructure of the metallographic image is automatically analyzed by statistical methods. Finally, automatically extracted region of interests are compared with results of human experts.

Identification of Severity Scores of Atopy Investigation by Logistic Regression

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Abstract. This paper presents the use of logistic regression for identification of serious diseases influencing the results of Phadiatop test. Our data come from patients who underwent Phadiatop test in the University Hospital of Ostrava, The Clinic of Occupational and Preventive Medicine. In this model, we focus on personal anamneses of each patient and we create a model on the basis of symptoms and severity of diseases (asthma, allergic rhinitis, eczema and others). In addition, we also include the effects of smoking on the results of Phadiatop test. The aim of the analysis is to predict the results of the expensive Phadiatop test, which is the categorical dependent variable of the model. The developed model predicts the results of the Phadiatop test with 75% or even higher probability of success, which may represent significant financial savings for the diagnosis of atopy.

Massively Parallel Implementation of Total FETI

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Abstract. We describe an efficient massively parallel implementation of our variant of the FETI type domain decomposition method called Total FETI with a lumped preconditioner. Both numerical and parallel scalability of the proposed TFETI method are demonstrated on a 2D elastostatic benchmark up to 314,505,600 unknowns and 4800 cores. The results are also important for implementation of scalable algorithms for the solution of nonlinear contact problems of elasticity by TFETI based domain decomposition method.

Efficient Solvers for Linear Elasticity Problems Based on the Fictitious Domain Approach

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Abstract. The paper deals with the numerical solution of elliptic boundary value problems for 2D linear elasticity using the fictitious domain method in combination with the discrete Fourier transform and the FETI domain decomposition. We briefly mention the theoretical background of these methods, introduce resulting solvers, and demonstrate their efficiency on model benchmarks.

The Improvement of Projected SD for Quadratic Optimization with Separable Elliptic Constraints

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Abstract. This article is a first step to deal with problem with recently developed algorithm MPGP (modified proportioning with gradient projections) for minimization of a quadratic function subject to separable elliptic constraints. In some cases the number of iterations of this algorithm is really big. In this paper we try to detect these cases and we make a proposal of improving it. But for good reason we get in simpler algorithm – Projected Steepest Descend method. Only two-dimensional problem is considered.

Using Radial-Basis Functions on Image Reconstruction

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Abstract. There are lots of possibilities how to damage images or photos. Logos, scratches, noise and so on. This paper is focused on digital reconstruction of an old photograph scanned into digital image. This method of reconstruction uses RBF interpolation on damaged places in photography.

Wind Power Plant Analysis-Short Time Prediction of Electrical Power

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Abstract. The theme of this paper is power prediction of wind power stations. This analysis was realized by two different methods. Discrete method, that on the basis of available data, estimates the interval in which the power, for given probability and time shift, will be found. So the method estimates future power at given period, if current performance is 0.200 (measured in kW), etc. Another method, that has been applied, is the method of exponential smoothing - one of the many time series methods by which future wind speed, that closely relates to electric power of wind power plant, was calculated. Main goal of this article is not to present a comprehensive system for power predicting, but to show some basic ways of procedure with similar problems.

Multilevel Solvers with Aggregations and K-Cycle

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Abstract. The finite element analysis of properties of heterogeneous materials needs to deal with the ill-conditioning of the arising algebraic system caused by the heterogeneity. To overcome this difficulty we use multilevel preconditioner for CG method based on Schwarz-type method with inner K-cycle and appropriate coarse level construction.

Object-oriented Distributed Matrix Data Structures Allowing Multi-GPU Computation

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Abstract. Distributed objects technology allows transparent parallelization of numerical linear algebra algorithms. We describe the implementation done in OOSol library using distributed objects technology CORBA. The object oriented design allows the same algorithms to be run on a single processor machine, as well on disjoint memory clusters or even using multiple GPU accelerators. Finally, we provide results of benchmarks done on several machines with GPU.

Monte Carlo as a Tool for a Dynamic Reliability Problem

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Abstract. The main purpose of the paper is to illustrate and model, by means of proper examples, a complex dynamic system and to assess its reliability performance via direct Monte-Carlo simulations and bootstrap method. In principle, the simulation method is not a new method, but the paper shows that in connection with new computation technology which gives us a chance how a complex dynamic system could be effectively evaluated. One of the main problems in reliability assessment of complex dynamic systems is to take into account time dependencies of the system structure resulting from changes of its physical parameters. One way to solve the problem is the use of a Petri net approach. Results obtained by both exact analytical approach and the hybrid-stochastic Petri net approach will be confronted with the newly modified Monte Carlo approach.

Using Software-defined Radio Concept in Communication Systems to Analysis M-QAM Digital Modulation Technique

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Abstract. The speed at which new digital communication systems are being developed is increasing dramatically. Growing quantity of transmitted information and growing quantity of users require development of modern communication systems based on new principles; existing systems are quickly becoming obsolete technologically. Digital radio and television broadcasting systems are used multistate digital modulation M-QAM for transmission of information. This paper presents real results, which illustrate the link between number of symbols in M-state QAM modulation, SNR and BER. Constellation diagrams of transmitted and received symbols (with superposition of noise) were presented in the article. Simple picture is transmitted through simulated radio channel to show the result of signal impairments. Experiments were done using software defined radio concept of communication system. Modular PXI HW platform was used in connection with graphically oriented development environment. This combination of modular HW and flexible SW components allows changing the communication protocol, modulation scheme, frequency bandwidth and other parameters in a very simple way by changing the software part of the system.

Conducting Polymers – Polyaniline

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Abstract. Conductive polymers are a very interesting group of organic polymers where polyaniline (PANI) is potentially the most interesting. The use of this polymer is offered in sensor applications, in integrated technology, etc. Because it is not too researched material, it was necessary to perform basic measurements. In this article are discussed the results of measurements of homogeneity PANI films, conductivity, polarization and reflectivity.

Synthesis of Speechlike Signals for Masking Acoustic Information

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Abstract. The structure of the "speechlike" signal generation system containing speaker verification module for selection the allophone database corresponding to the speaker for active acoustic information security by masking is developed. The voice activity detection (VAD) algorithm is developed and realized. Speech segmentation methods are analyzed. The speech segmentation algorithm is developed and realized. The article contains the description of the synthesizer of speechlike signals, voice activity detection module and speech segmentation module as well.

Mobile FSO Remote Controlled Model

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Abstract. In this paper we shortly brief about mobile free space optics concept, which is capable to maintain optical link not only for point-to-point connection. For this reason we built optically controlled car model. So we can easily simulate the mutual movement between transmitter and receiver. For optical communication we use two high power LED diodes at wavelength 850nm. Main objective was to build the model capable to show how the FSO network will behave in the constant position changes in various ambient lighting conditions.

IVAS System for The Indect Project

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Abstract. The paper deals with multimedia support and remote control of Asterisk SW PBX. Main function of the Asterisk is connecting audio and video calls between two or multiple users. We developed technique for recording and playback of video files. Another our task in The INDECT project was remote control of Asterisk SW PBX. Remote control we developed over CLI interface and AMI interface. The IVAS system is using all of these interfaces to communicate to The INDECT portal.

Communication Among Cars by Optical Free Space Networks

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Abstract. Safety of road users, reducing mortality on European roads, the growth of individual transport and reducing C02 emissions are some of the many questions that come to the fore in the issue of automotive industry. Currently, the only possible solution to these questions is the introduction of information- communication systems. Newly established organization dealing with this problem based their solutions on the utilization of wireless communications in the fields of radio waves. However, due to changes in the quality of lighting in cars through the implementation of LED technology, in conjunction with adaptive system of lighting, seem to be optical communication systems based on micro-cells networks as an interesting alternative.

Optical Power Measurement in Free Space Optical Link

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Abstract. In our over-engineered world, the information is more valuable, the access to them is very important. Therefore it is necessary to develop new, faster and better ways of data transmission. One of the fast accesses is a Free Space Optical links, which are very secure against eavesdropping, but their disadvantage is dependence on atmospheric effects. This article summarizes some finding from measurement of optical power distribution in beam profile of Free Space Optical link, which is placed on the rector department and on the observatory.

Embedded Solution of SIP Communication Server

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Abstract. This article discusses the development and implementation of embedded solution of SIP communication server with an easy integration into the computer network based on open-source tools. This device is a PBX system for IP telephony, suitable for small and medium sized organizations. Hardware device, ie the software installed on optimized proprietary hardware, can be plugged into an existing network just before the operation. It also provides an interface for administrators and end users, futhermore by using a standard VoIP protocol the system is compatible with any device and service provider of SIP. The article describes the system design and the individual elements, which are contained in the solution.

OptiSystem in E-learning Presentation

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Abstract. Nowadays there are several software which allow us to scan monitor and record mouse motion, writing text, objects moving etc. These software can be used to create detail service manual of applications. These software speed very up teachers work because each student can start the final video multiple times and he can better learn applications. In this article there is described Adobe® Captivate® 4 software.

Self-Reproduction and Self-Assembly
in Multi-Robot Systems

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Abstract. This paper introduces the self-reproduction and the adaptation mechanism of multi-robot systems. The approach is derived from the evolution theory. During the replication multi-robot systems find lacking parts (modules) which are required to be connected into the already completed body-structure. Every additional connection in the replication process requires adaptation because body-structure has been changed and the adaptation tries to preserve certain behavior of these multi-robot systems. Approach utilizes multi-agent, evolution theory and also graph theory, which try to provide realization of the self-reproduction (self assembling) process.

Registration of the object position changes in space using LabView environment

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Abstract. The paper presents a system for registering changes of object position in space, using a laser rangefinder, an HD camera, and precision biaxial motor. Advantages, limitations and the possibility use of the system are presented. The system software was made in a Labview environment.

A data partitioning problem in programming of massively parallel processors

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Abstract. The article presents the problem of data partitioning, which is crucial in the case of High-Performance Computing (HPC) in a massively parallel architecture. The OpenCL language is outlined, which is used for programming GPUs in order to realize the parallel computing problem. The calculations a performed on the Tesla C1060 and GeForce GT540M. The obtained results enable to property manage the task of grouping work-items into work-groups.

High resolution thermograms via distortion correction

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Abstract. The article describes how to obtain high-resolution thermal images from a camera equipped with telephoto lens of resolution 16-times greater than the standard lens. Using the 320x240 pixels camera we can receive the 1.3 megapixel thermonogram in a similar way as for panorama images. The process of automated precise measurement of thermograms makes use of a biaxial turntable on which the camera is installed. The application is developed in the LabVIEW driver using CompactRIO Real-Time Controller. The complex thermograms can be analyzed by the software provided with the camera.

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