INFORMATION AND COMPUTER TECHNOLOGIES

Displaying formulas as embedded calculations in scientific literature, textbooks and educational web apps

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Mathematical expressions can be added or edited in electronic media as embedded calculations. Formulas in an electronic document are not just expressions written in a formal language, they are also an object that could be studied, helping to comprehend a text and avoid many typos and mistakes typical for mathematical formulas found in print. This article describes some features of formulas embedded in online scientific literature and educational web apps. The article is based on the experience of teaching of engineering subjects and math assisted by the visualization of calculations. The authors examine key features and practical application of calculations and formulas embedded into the scientific and educational texts.

Keywords: embedded computing, electronic publications, computational methods, Mathcad, online publications, virtual laboratory, Knovel Interactive Equations

Development of methods for determining the tracking software systems accuracy, application of a wireless communication device and self-contained power supply in heliostat units with centralized monitoring and control system

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This article deals with determination of accuracy in tracking software systems, and advantages of the heliostat automatic control system that utilizes measuring informational and control systems comprising wireless measuring instruments and information-processing equipment. The heliostat automatic control system covered in the article is one of the types of measuring informational and control systems. As distinct from other measuring informational systems, the described heliostat control system operates only when tracking parameters deviate towards the maximum permitted values.

Use of wireless communication between detectors, transducers and industrial logical controllers in modern optical SPS heliostat control systems is more advantageous than laying hundreds meters of cable.

To provide power supply, it is proposed to equip each heliostat with a self-contained power supply, since heliostat operates when concentrated solar radiation in the receiver is sufficient for steam generation, while the rest of the time it is in the standby mode. That is why use of a solar battery-powered self-contained power supply is more advantageous than use of centralized power supply from the industrial network.

Keywords: mathematical model, automatic control systems, heliostat, wireless communication, power supply

Combining web engineering methods to cover lifecycle

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Web applications have rapidly evolved in the last decade, whilst web engineering methods have been lacking in the process development Web applications. One of the issues in web engineering methods is that no single web engineering method provides adequate coverage for the whole life cycle, because the web engineering methods are divided into three phases, which are; requirements, analysis/design, and implementation. Therefore, each method designed to special concern. It is obvious that we need to design a new method to cover the whole lifecycle to solve this issue. In this paper, we propose a framework for the new web engineering method through a combination of three methods comprising: Navigational Development Techniques (NDT) method for requirements phase; UML-Based Web Engineering (UWE) for analysis/design phase; and Interaction Flow Modeling Language (IFML) for the implementation phase. NDT and UWE are the most representative methods to develop web applications; while IFML is the newest method that focused on design and implementation. Our framework for the new method can support a whole lifecycle. Moreover, this method is more usable from developers.

Keywords: Web engineering, methods, combination, lifecycle, IFML

Model reservation resource of computer complexes system

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The article presents a method for calculating redundancy systems for platform management and organization of the movement of high-speed trains. The model is developed on the mathematical formalism of Petri nets. Calculated estimated time system failover. Proved the feasibility of using a majority redundancy.

Keywords: information system, Petri net, information complex, reservation of computer complex

Application of artificial neural networks for handwritten biometric images recognition

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The development of information technology leads to new requirements for the development of security systems, identity authentication and other protection mechanisms. The article is devoted to the use of artificial neural networks for handwritten biometric images recognition that are used in high-authentication systems. There is given a general structure of the biometric-neural

network authentication system, the structural scheme of information processing in biometric-neural network authentication systems, the structural scheme for learning the neural network converter of the biometric parameters vectors in the key code (password). There is formed and trained a network of neurons, are formed neural network containers on the basis of structures. The choice of the length of the biocode of neural network converters is substantiated. After graduation, testing is conducted and the probabilities of errors of the first and second kind are determined. There is given an example of a software implementation, where are given a learning mode, checking the results of training, testing the results of training.

Keywords: artificial neural networks, authentication, biometric image, first-kind errors, second-kind errors

MATHEMATICAL AND COMPUTER MODELLING

Synthesis and simulation of digital pseudo-random impulse sequence generator based on PLIC FPGA Xilinx using CAD Vivado 2016.2 and development of acoustic noise generator scheme for the protection of information

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In this work with the help of CAD Vivado 2016.2 system and Verilog hardware description language there were synthesized, simulated and built temporary digital pseudo-random impulse sequence generator diagrams based on CAD of FPGA families of the Xilinx company and eight-rate shift LFSR register, which can be used in cryptography to create a stream encryption algorithms. On the basis of a digital pseudo-random impulse sequence generator and active low-pass filter of the second order of Sallen - Key there was constructed an electric diagram of the acoustic noise generator that provides protection against wiretapping by using embedded devices, telephone conversations, laser wiretapping system and unauthorized dictaphone recording of confidential voice information by creating a masking vibration noise.

Keywords: computer-aided design, hardware description languages, programmable logic integrated circuits, synthesizing, simulation, circuit simulation, pseudo-random impulse sequence

A modified non-monotone method with 3-1 piecewise NCP function for nonlinear complementary problem

Ke Su, Dan Yang

In this paper, we proposed a modified nonmonotone method for nonlinear complementarity problem, different from the existed methods, we transform the original problem to a semi-smooth equation by using a piecewise NCP function, and combined with the nonmonotone line search. Only one nonlinear equations need to be solved per iteration so that the computational costs are reduced. Under some suitable assumptions, we give the convergence properties of the proposed method and the numerical results to show that our method is efficient.

Keywords: nonlinear complementary problem, piecewise NCP function, nonmonotone , global convergence

Improving the reliability of the managed of electric drives with a synchronous generator

Elena Loginova

The article examines the dynamic properties of the excitation control system of synchronous generator of capacity 2200kW, which comprises a converter - bridge rectifier. It was investigated the influence of the type of bridge rectifier - of thyristor symmetric bridge and of asymmetric bridge - on transient processes of synchronous generator in emergency operation. This problem was solved by numerical methods.

A mathematical model of synchronous generator excitation control system. In order to make the model of the generator excitation system has been used plugin SIMULINK mathematical software MATLAB.

During simulation were calculated currents short circuit of the synchronous generator in the case of using in system excitation a thyristor symmetrical bridge and asymmetrical bridge. Calculations have shown that the use of symmetric thyristor bridge reduces times the short circuit fivefold. This allows us to recommend used a symmetrical bridge in the electric drive system.

Keywords: excitation system of the synchronous generator, the short-circuit mode

Development of the SVM classifier by means of the hybrid versions of the particle swarm optimization algorithm based on the grid search

Liliya Demidova, Irina Klyueva

In this article the approaches to the problem solving of searching of the parameters of the SVM classifier based on the hybridization of the particle swarm optimization algorithm (PSO algorithm) and the grid search algorithms with the aim of providing of high quality classification decisions have been considered. The paper presents two hybrid versions of the basic PSO algorithm, involving the use of the classical Grid Search (GS) algorithm and Design of Experiment (DOE) algorithm correspondingly. It is proposed to use the canonical PSO algorithm as the basic algorithm. The results of experimental studies confirm the application efficiency of the hybrid versions of the basic PSO algorithm with the aim of reducing of the time expenditures for searching the optimum parameters of the SVM classifier while maintaining of high quality of its classification decisions.

Keywords: classification, particle swarm optimization algorithm, grid search algorithm, SVM classifier, radial basis kernel function

A literature review on algorithms for the load balancing in cloud computing environments and their future trends

Aanjey Mani Tripathi, Sarvpal Singh

Cloud computing is a computing utility which provides basic service for computing. It is a high performance distributed computing which has the huge collection of virtual resources that can be easily accessed anytime using the internet similar to pay as you go, model. A cloud defines set of virtual computers connected to each other in a form of parallel and distributed system. It ensures the dynamic provision of resources based on service level agreement (SLA) to ameliorate one or more objectives. To attain this goal several research challenges have been faced in the area of cloud computing, And the Load balancing is one of them, which aim at equalizing the workload among all the obtainable nodes by minimizing execution time, minimizing communication delays, maximising resource utilization and maximising throughput. This paper disburses a literature review of existing load balancing algorithms suggested so for and categorized under different metrics enveloping the advantages and disadvantages of each. An overview of the important research challenges of these algorithms is presented at the end with some possible ideas for improvement.

Keywords: Cloud computing, Load balancing algorithm, virtual machine