MATHEMATICAL AND COMPUTER MODELLING

Factors and data for RES evaluation

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Usage of renewable energy sources (RES) – is a modern powerful trend in energy development. "Green energy" technologies (technologies of gathering energy from renewable sources) are actively developed and will allow in the future significantly to reduce use of non-renewable resources (oil, gas, coal, peat), reduce the ecological impact of energy plants, improve the ecology around populated areas, reduce the cost of obtaining energy in some cases, increase the autonomy of life support systems and energy security of the country. RES are spatially distributed resources that depend on various factors. Thus, heterogeneous data and correctly defined factors are needed to evaluation of renewable resources. Paper considers the processes of RES potential evaluation, factors and data sources available for researchers. We discuss stages of RES potential evaluation, factors that can contribute to or hinder using RES and some data sources which can be used during the process. The Kazakhstan problems are briefly discussed.

Keywords: Renewable energy resources, data sources, information systems, multiple-criteria decision making

Proposition of web services composition approach basing of model-driven approach and multi-agent systems

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Web services composition is an emerging paradigm for application integration within and across organizations and enterprises. For this reason, various approaches and formalism have been proposed and used for web services composition. Among these approaches we have the Models Driven Approach (MDA), which concentrates on the realization of abstract models. Thus, the phase of specification represents an important part of the cycle of development of composite web service. To proceed to this cycle of development, a developer has to elaborate a specification which allows the modelling of the global behaviour of the system, to verify formally this model for assuring his quality, then pass to the implementation of the composed service. In the paper we present a summary of our proposed approach of web services composition based on MDA, thus it is separated into three tasks: specification using BPMN notation and Multi-agent reactive decisional (MARDS) model, formal verification using LOTOS language and implementation using BPEL language. Then we present a case study to prove the feasibility and reliability of our proposed approach.

Keywords: Web services composition MDA, Specification MARDS Formal verification

Security challenges of vehicular cloud computing applications: from software architecture viewpoint

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The use of vehicular ad-hoc network is considered by researchers in recent years. Although these networks have been deployed in real world offering appropriate services to their users, researches show that their current architecture have different development and management problems. It seems that cloud computing due to its scalability and other features is an appropriate technology to compensate the shortcomings. By moving the vehicular ad-hoc network to the cloud, we have the new technology of vehicular cloud network. Considering quality attribute is the best approach to improve the vehicular cloud network applications' software architecture. Among the quality attributes, security is so important and the lack of security in the system causes the rejection of these technologies by users. This paper studies vehicular cloud networking security. In order to achieve the security in vehicular cloud network applications, first of all a list of applications is prepared. Then applications are categorized to identify various security threats. To confront the existing threats, various security tactics are provided. Finally an approach to increase the security in vehicular cloud applications is proposed.

Keywords: Vehicular cloud computing, VANET, Security, Software Architecture

Fuzzy logic based job scheduling algorithm in cloud environment

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Cloud computing is a technology which is growing faster day by day and applied in various fields such as in industry, commerce, and research. Handling resources and the task according to the need of user is the current major issue. In cloud environment when users submit their task, it selects the best virtual machine on which the task can execute. Considering the commercialization and virtualization aspect of the Cloud Environment, this paper proposes an algorithm for Job scheduling which ensures fairness of the resource allocation according to the Quality of service. It mainly focuses on two problems. One is the selection of virtual machine(s) which are eligible to execute the task. Another problem is justification of the task according to the quality of service. Our approach simplifies the complexity of the algorithm and reduces the overhead associated with selecting appropriate and justified virtual machine for a given task. It ensures the fairness of the resource allocation for each classified task and also justifies the overall system allocation. Further, it uses fuzzy logic to adjust the general expectation vector of the task based on the fairness of the allocation of resource.

Keywords: Cloud Computing, QoS, Fairness, Job scheduling, Resource allocation

Cognitive evolution in software development life cycle through design thinking

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Software engineering is methodical, well-organized and proven approach to the advancement, operation and maintenance of the

software. Agility moves toward compact set of process activity. Design thinking is an organized, intellectual process in which designers ideate and validate notion for solving the given problem whose outcome and function fulfills clients' objectives or users' needs under specified set of constraints. This paper describes cognitive impact of design engineering process on software development life cycle (SDLC) in agile development community. The paper also depicts correlation between various design engineering canvases and phases within software development lifecycle in agile models.

Keywords: Mind Mapping, Design Thinking, Agile Methodology, Storytelling, Prototyping

Optimal implementation of critical peak pricing in cloud computing

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Cloud computing offers a variety of services and hence the opportunity to make profit by using a suitable pricing strategy by selling these services. Yet, the instability of the dynamic price, create a risk for cloud tenants so as to effectively implement a pricing strategy which is beneficial for both tenants and end user. To overcome the dynamic price risk for tenant, method of dynamic pricing scheme between tenants and end user is employed. This paper proposes a model of dynamic pricing scheme, i.e. Critical Peak Pricing based on demand response program for profit of cloud tenants as well as end user satisfaction. The proposed model used the price responsiveness model of end user and the parameters of Critical Peak Pricing that simultaneously affects the benefit of cloud tenants and end user.

Keywords: Cloud computing, critical peak pricing (CPP), demand response, critical days, cloud tenant, end user

Computer modelling in the physics course for IT students

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Since today's students have a great interest in information and communication technologies (ICT), we must recognize that it contains a significant potential for development innovative approaches to learning and teaching. Organization of students' learning activities using ICT and the problem-project method can significantly enhance the feasibility of additional forms of educational processes. The author use ICT to organize the IT students' integrated problem-project activities to computer modelling of physical processes. Second-year IT students of the Technical University implement individual virtual projects. The problem-project method generates students' interest to the process of creating program products and to models of physical processes and phenomena. This complex activity stimulates processes of learning and skills development for multiple subject areas such as physics, mathematics, and programming. Usually the IT students' virtual projects are created using high-level languages C ++ or C#, and 3D editors. The students' virtual projects ultimately are software products that can be used in the e-learning environment complementing existing traditional didactic means with virtual computer experiments. The programs make it possible to do virtual experiments, observe and analyse behaviours of simulated systems and features of physical processes. In this article some virtual labs designed by our second year IT students are demonstrated. Some of virtual labs have real prototypes in laboratories and some are unique.

Keywords: learning and teaching physics, information and communication technologies, problem-project activities, computer modelling, virtual labs

A comparative study between artificial immune system and incremental neural network for digits handwritten recognition

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The artificial immune systems and the incremental neural networks are among novel paradigms used in artificial intelligence and pattern recognition. In this paper, we use MNIST database in order to compare these two approaches and to extract advantages and disadvantages of each one. This work is an introduction to improve the artificial immune system using principle of the incremental neural network.

Keywords: Artificial Immune Systems, Incremental Neural Network, CLONCLAS, I2GNG, Digit Handwritten Recognition

Implementation of the heteroskedasticity testing for linear regression model

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The article discusses the problem of heteroskedasticity, which can arise in the process of calculating econometric models of large dimension and ways to overcome it. Heteroskedasticity distorts the value of the true standard deviation of the prediction errors. This can be accompanied by both an increase and a decrease in the confidence interval. We gave the principles of implementing the most common tests that are used to detect heteroskedasticity in constructing linear regression models, and compared their sensitivity. The advantage of this paper is that real empirical data are used to test for heteroskedasticity. For implementing the testing there is developed the special software with using of the algorithmic programming language MATLAB. The purpose of the article is to describe the functions implemented in the form of mfiles (MATLAB environment files) to check for heteroskedasticity in multifactor regression models. To do this, modified algorithms for the tests on heteroskedasticity were used. Experimental studies of the work of the program were carried out for various linear regression models both the models of the Department of Higher Mathematics and Mathematical Methods in Economy of Simon Kuznets Kharkiv National University of Economics, and econometric models which were published recently by leading journals.

Keywords: regression model, homoskedasticity, testing for heteroskedasticity, software environment MATLAB