

Cumulative Index

Nanoscience and Nanotechnology

Yu N Shunin, S Bellucci, Yu F Zhukovskii, V I Gopejenko, N Burlutskaya, T Lobanova-Shunina, A Capobianchi, F Micciulla CNT-Fe-Pt interconnect electromagnetic simulations for magnetically stimulated CNT growth and novel memory nanodevices

Computer Modelling & New Technologies 2014 18(2) 7-23

The parametrically controlled production of carbon nanotubes (CNTs) with predefined morphologies is a topical technological problem for modern nanoelectronics. The chemical vapor deposition (CVD) technique for single walled carbon nanotubes (SWCNTs) in the presence of various metal nanoparticle catalysts is generally used now. The application of a magnetically stimulated CVD process scheme and catalyst nanoparticles with a strong magnetism promises additional possibilities for the CVD process management and allows expecting a predictable growth of CNTs with set chiralities and diameters. The main attention is focused on the magnetically anisotropy Pt-Fe in L10 crystallographic phase nanoparticles effect research. The developed cluster approach based on the multiple scattering theory formalism, realistic analytical and coherent potentials, as well as effective medium approximation (EMA-CPA), can be effectively used for modeling of nanosized systems. It allows us to calculate the dispersion law $E(k)$, electronic density of states, conductivity, etc. This theoretical approach is used for simulation of fundamental electromagnetic properties in Pt-Fe L10-CNT interconnects, which are responsible for developing CNTs morphologies. The developed model of 'effective bonds' and the model of magnetic stimulation for growing CNTs morphologies generated on the Pt-Fe nanoparticle surface are applied for the evaluation of the expected CNT chiralities distribution. The model and conditions controlled magnetically, which stimulate CNT growth in the CVD process, aimed at the predictable SWCNT diameter and chirality and based on Pt-Fe L10 catalyst are discussed. The possibilities of CNT forest growing on FePt nanoparticles for magnetic nanomemory are also evaluated.

Keywords: chemical vapor deposition (CVD), CNTs CVD magnetically controlled growth, arc discharge technique CNTs creation, Pt-Fe nanodrops –catalysts, fundamental electromagnetic properties in Pt-Fe L10-CNT interconnect, model of magnetically controlled CNTs growth

Fundamental Nature Phenomena

A Ershkovich On the classical roots of the Schroedinger equation

Computer Modelling & New Technologies 2014 18(2) 24-26

In semiclassical approximation Schroedinger equation is known to reduce to classical Hamilton-Jacobi equation. These equations look strikingly similar. An idea that just the Hamilton-Jacobi equation became a prototype of the Schroedinger equation arises. Arguments in favour of this assumption are supplied. Then it is no wonder that Aharonov-Bohm effect was recently derived directly from the classical Hamilton-Jacobi equation (without using Schroedinger equation), and hence, it is, in fact, of classical origin. The electron-field interaction is explained within the framework of classical electrodynamics. Thus, the so-called unlocal interaction becomes unnecessary.

Keywords: Schroedinger equation, Hamilton-Jacobi equation, Aharonov-Bohm effect

Mathematical and Computer Modelling

Xiao Liang, Wei Li, Weitong Fan, Guocheng Zhao Numerical simulation and hydrodynamic performance prediction for hydroplane longitudinal motion

Computer Modelling & New Technologies 2014 18(2) 27-32

Aiming at hydrodynamic performance prediction for hydroplane longitudinal motion, numerical simulation for a hydroplane motion was carried out by using VOF and RNG $k-\epsilon$ model and solving Navier-Stokes equation under FLUENT software platform. Evolution of ship resistance was obtained as the velocity change, and flow field situation and dynamic pressure variation of hydroplane hull bottom were reflected intuitively. By comparing and analysing the results among numerical simulation calculation and ship model experiments and theoretical estimation, it was verified that hydrodynamic performance prediction for hydroplane longitudinal motion based on numerical simulation calculation under FLUENT is feasible and precise enough.

Keywords: numerical simulation, hydrodynamic performance prediction, hydroplane, FLUENT

Song Xiao-ru, Chen Hua, Song Bao-wei, Wu Jie Research on adaptive AUV tracking control system based on least squares support vector machine

Computer Modelling & New Technologies 2014 18(2) 33-39

Aimed at the nonlinear, uncertainties and impreciseness in AUV tracking control, an adaptive LSSVM control is highlighted. It is including the approximate dynamic inversion control law, linear controller and the robust adaptive LSSVM controller. The key is designed that adaptive LSSVM controller, which is to decrease or offset the uncertain dynamic inverse model errors. The online adjustment LSSVM parameters rules are deduced by the Lyapunov stability theorem. So the closed-loop tracking control system's stability and asymptotical convergence of tracking error can be guaranteed. It can be seen that the tracking errors converge and stay at a small neighbourhood of zero. At last taken a certain real AUV as an example, the numerical simulation results are given in the presence of the ocean current wave interference. They show the proposed method has good tracking performance and a certain robustness against modelling errors.

Keywords: AUV, LSSVM, tracking control, adaptive controller

Yaping Zhang, Chunxiao Liu, Hong Zhang, Guozhu Cheng A study on capacity of signalized intersection under snow-ice conditions based on classical model modification

Computer Modelling & New Technologies 2014 18(2) 40-45

As the common climatic phenomena frequently occurring in northern China in winter, snow and ice weathers have made great influence to the capacity of signalized intersection. By starting from snow and ice conditions, this paper makes improved correction about the calculation of capacity of signalized intersection respectively based on HCM Method and Method of Stopping Line. On the basis of HCM Method, the author comprehensively considers factors influencing the capacity of signalized intersection under snow and ice conditions, and calibrates the integrated parameters influencing the capacity of signalized intersection under snow and ice conditions; grounded on Method of Stopping Line, the author then calibrates various parameters and makes classified study about each parameter separately according to snow weather and freezing condition, finally giving out parameter values under various states. With the help of the revised model, the paper calculates the capacity of signalized intersection and then makes the comparison between traffic capacities under various snow and ice conditions and that with capacity of signalized intersection under normal weather, hence with strong practical significance.

Keywords: Snow and ice conditions; Signalized intersection; capacity; Parameter modification; Comparative analysis

Zhang Hong, Li Jie, Lv Yuejing Structure performance analysis of Vehicular Ad Hoc Networks based on complex network theory

Computer Modelling & New Technologies 2014 18(2) 46-51

A very promising direction in intelligent transportation system is the applications based on vehicular ad-hoc networks (VANET). VANET of a country is one of the most importation indicators of its economic growth. In this paper, we analysed the characteristics of VANET network topology using complex network theory. The author contribute VANET model, analyse the statistical properties of complex network based on the degree distribution, the clustering coefficient, the average path length and find that the network has scale-free and small world features. The structure and properties of VANET have great implications for traffic congestion and urban planning. The robustness analysis indicates that VANET is robust to random attack when considering static robustness, but somewhat vulnerable to intentional attack.

Keywords: complex network, VANET, topological analysis, robustness

Xingping Wei, Jun Li, Xiaoyu Liu, Shiping Zhao A fast on-line two-dimensional sizes measurement method for micro part

Computer Modelling & New Technologies 2014 18(2) 52-56

In order to meet the manufacturing process of micro part, where the space is small the production speed, temperature and vibration frequency are high, a novel method, which is used to measure the two-dimensional (2-D) sizes of the micro part fast and on-line, was proposed based on optical fibre image bundles and CCD camera. Double parallel lights were projected on the part symmetrically. The outline information of the part image on CCD camera through optical fibre image bundles and the part 2-D sizes can be obtained from the CCD camera. The optical fibre image bundles can be embedded into tool-set or fixed in limited space due to its small size, flexibility and bendability. Therefore, the method overcomes the bad influences from the part hard processing conditions effectively. Experiments

were carried out to measure workpiece with dimensions of 6.124 mm x 0.424 mm. The results show that the measurement time was less than 0.2 second and the accuracy was up to 25µm.

Keywords: On-line Measurement, Micro-part, Optical Fibre Image Bundles, Two-dimensional Sizes, CCD

Meng Xian-Yong, Liu Yang, Gao Yu-Xiao, Wang Mei, Liu Zhi-Hui Basic set of equations in mesoscale meteorological model associated with local fractional derivative operators involving the cantor and cantor-type spherical coordinates

Computer Modelling & New Technologies 2014 18(2) 57-62

Recently, the local fractional calculus theory was applied to process the non-differentiable phenomena in fractal domain. The main object of this paper is to present the basic set of equations in mesoscale meteorological model on the Cantor sets involving local fractional derivative operators and the corresponding cantor-type spherical coordinate equations. It is shown that these equations are efficient and accurate for describing some of atmospheric motion.

Keywords: Mathematic, basic set of equations, mesoscale meteorological model

Junsheng Jiao DSM control strategy of solid oxide fuel cell distributed generation system

Computer Modelling & New Technologies 2014 18(2) 63-69

The distributed power generation system of fuel cell has received the widespread attention in recent years for its pro-environment and high efficiency. The solid oxide fuel cell (SOFC) is a new power system, which turns chemical energy of fuels into electrical energy directly at middle and high temperature. Mathematical model of SOFC is analysed and the main circuit structure of independent power generation system is designed in this paper. The traditional PI control is adopted in DC/DC boost circuit to ensure the fuel cell can provide a stable DC output voltage. The three-phase inverter is used in DC/AC circuit and the dynamic equation derived from three-phase inverter is transformed to the synchronous rotating coordinate system. An innovative discrete sliding mode (DSM) control technology is applied and the system output stable sinusoidal AC voltage. The simulation experiments prove that SOFC power systems, in a certain range, can quickly and dynamically trace the change of the input voltage and load using DSM control.

Keywords: SOFC, Discrete Sliding Mode, Control, DC/AC, Converter

Jing Guoqing, Liu Guixian, Xu Yang, Zhang Jiong Micro-analysis of sub-ballast direct shearing under normal stress

Computer Modelling & New Technologies 2014 18(2) 70-75

This paper presents sub-ballast material analysis through Discrete Element Modelling (DEM) method to investigate its direct shear tests behaviour. Laboratory direct shear box tests were conducted on granite sub-ballast aggregate samples under different normal stress. The size, particle size distribution (PSD) properties of the sub-ballast particles were considered in the analysis. Simultaneously, direct shear box DEM simulations were conducted for different normal stress conditions, the sub-ballast micro-characteristics of the direct shearing tests were analysed, the contact force, displacement etc. index variation interrelated with the direct shearing tests conditions. The shear stress-shear displacement curves predicted from the DEM simulations were in reasonably good agreement with laboratory test results at all normal stress levels that shear box tests were conducted at. The results of discrete element modelling and tests of direct shear test for sub-ballast were presented. Such analysis may provide useful information on the understanding of sub-ballast with discrete element models. The micro-analysis and the direct shear tests were of importance to investigate the sub-ballast behaviour under the track system.

Keywords: direct shearing test; DEM; sub-ballast, normal stress

Liu Xiaoyong, Su Tiexiong, Zhang Yi Numerical analysis and improvement of torsional vibration of shaft systems for engine with cylinder deactivation

Computer Modelling & New Technologies 2014 18(2) 76-82

Cylinder deactivation is one of effective ways to improve fuel economy of engine, but will lead to changes in torsional vibration characteristics of shaft systems for engine. A lumped parameter model of torsional vibration of shaft systems for engine with cylinder deactivation was established, the numerical computing method was determined, harmonic analysis was engaged for the excitation torque of single cylinder. Based on these studies, torsional vibration of a V8-engine was analysed, the natural frequency results was verified by comparing with that of utilizing software AMESIM. The forced vibration results show that the torsional angle displacement of crankshaft under cylinder deactivation increases obviously, which mainly consists of the 2nd order rolling vibrations, but torsional stress decreases little. In order to control the rolling vibration, the measure of increasing the rotational inertia of the flywheel was adopted. The

results after the adjustment show that the vibration of crankshaft was under control. In a word, the method is feasible and referred.

Keywords: Cylinder Deactivation, Torsional Vibration, Natural Frequency, Forced Vibration, Rolling Vibration, Excitation Torque

Gong Yusheng Simulation design of bursa-wolf coordinate transformation model based on the access

Computer Modelling & New Technologies 2014 18(2) 83-86

With the popularity of GNSS technology, problems of conversion between different spatial rectangular coordinate systems are often encountered, which are difficult to solve. This paper introduces Bursa-Wolf coordinate transformation model in detail, this model is widely used in the conversion between different spatial rectangular coordinate system, In order to improve the efficiency of calculation, This paper writes a simulation program using tables, forms, macros and VBA in Access, also the simulation program has been verified by production instances, and the reliability of its results is ensured.

Keywords: Access, VBA, Spatial rectangular coordinate system, Bursa-Wolf Model, Simulation

Nahla Mohamed Ahmed, Ling Chen New approaches for link prediction in temporal social networks

Computer Modelling & New Technologies 2014 18(2) 87-94

Link prediction in social networks has attracted increasing attention from various domains such as sociology, anthropology, information science, and computer sciences. In this work, efficient approaches to predict potential link in temporal social networks are presented. One approach is based on reduced static graph using a modified reduced adjacency matrix to reflect the frequency of each link. Another approach is based on indices integration and exploits both the temporal and topological information. The approach integrates the indices in all the time steps, which reflect the topological information, and uses a damping factor to emphasize the importance of more recent links. Experimental results on real datasets show that our approaches can efficiently predict future links in temporal social networks, and can achieve higher quality results than traditional methods.

Keywords: Social networks, temporal networks, link prediction

Liu Ranran, Li Zhengming Modelling study of p-xylene oxidative side-reaction based on Bayesian filtering

Computer Modelling & New Technologies 2014 18(2) 95-98

The combustion loss model of HAC and PX was established based on Bayesian filtering. Moreover, this neural network model regarded the main adjustable process parameters (residence time, the concentration of Co, Mn, Br, reaction temperature and solvent ratio) as the independent variables and the total content of CO and CO₂ as the dependent variable. The simulation results show that the network is well performed. The effects of process operating parameters on HAC and PX combustion loss are analysed based on the model. Wherein, the effects of residence time, reaction temperature on the combustion loss are bigger, while the effects of other factors are relatively small.

Keywords: Mathematical model, PX oxidative side-reaction, Bayesian filtering, soft sensor

Huang Li Bipartite graph model for RDF data cleansing

Computer Modelling & New Technologies 2014 18(2) 99-106

Many systems use RDF to describe information resources and semantic associations between resources. RDF data plays a very important role in advanced information retrieval. Due to diversity and imprecise of resources, duplicates exist in RDF data. The query and retrieval of RDF data are studied by many researchers. However, researchers seldom study RDF data cleansing. In this paper, we focus on RDF data cleansing. According to the features of RDF data, we propose a new approach. This approach combines similarity and connections among resources. First, we introduce an intermediate model, named RDF-Bipartite Graph model, to represent the RDF data. This model improves from Bipartite Statement-Value Graphs model. Then on the proposed model, we design a Subgraph-Extend method, to find the path connecting two nodes. This method detects the minimum subgraph containing two nodes for connect-path finding. It avoids the connect-weight setting in traditional method. Experiments on publication datasets show that the proposed method is efficient in duplicate detection of RDF data, and has high performance and accuracy.

Keywords: RDF, data cleansing, Bipartite Graph

Information and Computer Technologies**Yang Xianhui, Ren Honge, Jing Weipeng** A dynamic MAC protocol for wireless sensor network based network traffic monitoring and feedback*Computer Modelling & New Technologies 2014 18(2) 107-113*

WSN application in coal mine gas monitoring protects safety production. In order to save energy consumption, SMAC use periodic listen and sleep mechanism, against the problem of fixed duty cycle causes increased delay, this paper puts forward a new MAC protocol—DSMAC(Dynamic SMAC)which can feedback the channel's congestion level reasonably and adjust the duty cycle dynamically. The dominant idea of the new scheme is to record the packet amounts in the sending stage by sensor nodes, and according to the packet sending rate every sensor node can change its listening time adaptively when synchronization cycle finished to minimize delay and collisions, saving energy and channel resources. The result of simulation shows that compared with other MAC protocols, the DSMAC protocol can improve network throughput and reduce energy consumption in coal mine gas monitoring environment.

Keywords: WSN, periodic listen and sleep, duty cycle, DSMAC

Guoyan Yang, Xin Guan A concurrent MAC protocol based on location information in wireless sensor networks*Computer Modelling & New Technologies 2014 18(2) 114-119*

The traditional CSMA MAC node simply blocks its transmission if the medium is sensed to be busy. Thus, it is inefficient in terms of the network throughput due to overcautious estimation of the interference. In this paper, we propose a novel location-aware medium access protocol for data intensive wireless sensor networks. In this protocol, the contending nodes make use of their location information to achieve the concurrent transmission of exposed terminal so as to reduce collisions and improve the overall performance. We evaluate it in terms of delay and throughput and compare it with S-AMC using simulations. Results show that the proposed MAC protocol can take advantage of the location distribution of nodes to improve the average throughput of the network, reducing data transmission delay, and effectively improving the efficiency and performance in data intensive wireless sensor networks compared to S-AMC.

Keywords: exposed terminal, MAC protocol, wireless sensor networks, concurrent transmission

Huisong Li Flow-insensitive type qualifier inference on programming languages allowing type casts*Computer Modelling & New Technologies 2014 18(2) 120-125*

Type qualifiers are lightweight specifications of atomic properties that refine the standard types. Flow-insensitive type qualifier inference has been used in the CQual framework to improve the quality of C programs. However, type casts will affect the effectiveness of type qualifier inference, as they can lead to either accepting some flawed programs due to discarding some useful qualifier information, or rejecting some safe programs when the analysis is conservative. In this paper, we first present a language, which allows type casts and formalize its flow-insensitive qualifier inference system. We then show some examples to illustrate how qualifiers are lost because of type casts in CQual and give an idea on solving this problem.

Keywords: Type cast, Type inference, Flow-insensitive type

Lichuan Gu, Jianxiao Liu, Chengji Wang Fragments based tracking with adaptive multi-cue integration*Computer Modelling & New Technologies 2014 18(2) 126-134*

In this paper, we address the issue of part-based tracking by proposing a new fragments-based tracker with multi-cue integration. First the target template is divided into multiple fragments to get the contribution of each fragment to the possible positions of the target in the current frame, similarity measure is used in edge histogram and HSV histogram in every fragment, and the weights of cues integration are computed adaptively. Second we present a fragment template update mechanism with the discrimination between occlusions and appearance changes. The template is unchanged when the target is occluded and some fragments of template are updated in the case of appearance changes. In the experiments we use the indoor and outdoor test videos which contain the illumination changes, occlusions, and the appearance changes of targets. The experimental results show that our approach has strong robustness and high tracking accuracy.

Keywords: Target tracking, Multi-cue integration, Fragments tracking, Template update

Shaobo Shi, Qi Yue, Qin Wang FPGA based accelerator for parallel DBSCAN algorithm*Computer Modelling & New Technologies 2014 18(2) 135-142*

Data mining is playing a vital role in various application fields. One important issue in data mining is clustering, which is a process of grouping data with high similarity. Density-based clustering is an effective method that can find clusters in arbitrary shapes in feature space, and DBSCAN (Density-Based Algorithm for Discovering Clusters in Large Spatial Databases with Noise) is a basic one. With the tremendous increase of data sizes, the processing time taken by clustering algorithms can be several hours or more. In recent years, FPGA has provided a notable accelerating performance in data mining applications. In this paper, we study parallel DBSCAN algorithm and map it to FPGA based on the task-level and data-level parallelism architecture. Experimental results show that this accelerator can provide up to 86x speedup over a software implementation on general-purpose processor and 2.9x over a software implementation on graphic processor.

Keywords: Data mining, Clustering, Parallel DBSCAN, FPGA, Hardware Accelerator

Kanghong Duan, Hongxin Zhang, Shilin Song, Peigang Wang Micro real-time pre-emption operating system for industry wireless sensor networks*Computer Modelling & New Technologies 2014 18(2) 143-150*

Event-driven systems and thread-driven systems are two major design philosophy of operating system in wireless sensor networks. Systems based on multi-threaded are more timeliness than the event-driven systems, which can meet the requirements of time-critical tasks by means of task pre-emption, while systems based on event-driven are more energy efficient. Furthermore, μ COS-II is a classical system, which combines benefits in both systems. Therefore, our recent work we have shown that a micro real-time pre-emption operating system has been proposed on the basis of μ COS-II. First of all, a clear hardware abstraction layer (HAL) is given to combine the kernel and hardware in the system architecture. Moreover, this system is more capable of fitting both sensor network design goals of energy efficiency and timeliness. We are dedicated to modify the existing system from the scheduling strategy and data structure aspects, which lead to the performance of the modified system largely improved. Above all, the performance of our operating system is better than the original μ COS-II and TinyOS from task switch time, FLASH usage and RAM usage perspectives.

Keywords: Wireless Sensor Network, Operating System, Pre-emption, Improvement

Ao Jianfeng Ground crack extraction in mining subsidence areas based on point cloud data*Computer Modelling & New Technologies 2014 18(2) 151-156*

During the underground mining of mineral resources, some ground points within a certain range above the working face will migrate correspondingly. The inconsistent horizontal migration of various ground points, due to different impacting time and degree, will lead to deformation of the ground surface, and when it reaches a certain degree, discontinuous damages to the continuous ground surface will occur, which are shown as cracks on the ground surface. In this paper, to extract planar cracks contained in the point cloud data, the point cloud data was firstly projected in the elevation direction for 2D processing and then a thickening algorithm for scattered point clouds was proposed. The point cloud data at different distances from the instrument was thickened block by block by choosing different thickening windows in order to highlight the crack data in the 2D image and to obtain the point cloud image applicable to the regular edge detection algorithm. Finally, the Canny operator was used to extract the edge information of cracks. In the end, the algorithm was tested in engineering projects and proved to be highly effective in extracting crack data.

Keywords: Crack Extraction, Point Cloud, Mining, Subsidence

Lou Ning, Zheng Xiaobo, Yang Yongchong Expression model of multi-resolution 3D geographical space*Computer Modelling & New Technologies 2014 18(2) 157-160*

Aiming at improving deficiencies in multi-resolution two-dimensional expression of geographic information method, this paper studied method of multi-resolution 3D expression of geographical information, putting forward grid method to express different regional landforms separately and a method of expressing different regional ground objects on level of detail in three aspects as shape, texture and properties, plus an example to simulate and illustrate. Multi-resolution 3D expression of geo-information has broad application prospects in smart city and city planning, which has a certain exploring value for the massive information, for its expression and visualization.

Keywords: Multi-resolution, 3D visualization, Geographical Space Model, 3D terrain model, 3D ground object model

Chen Qing, Yong Zhong, Liuming Xiang Cloud database dynamic route scheduling based on polymorphic ant colony optimization algorithm

Computer Modelling & New Technologies 2014 18(2) 161-165

Big Data era spawned the development of Cloud database. As a database, which need easily scale out, how to quickly find the available nodes are focuses of the study. Ant colony algorithm is based on bionic optimization algorithm and has the characters of smart searching, global optimization, robustness, distributed computing and easily combined with other algorithms, but the algorithm is prone to premature convergence, making the results often caught local optimum. According to this, polymorphic ant colony algorithm was proposed which combined with a Cloud database; the algorithm can quickly and reasonably find the nodes in Cloud environment, reducing the load of routing, thus greatly improved the Cloud database's ability of scaling out.

Keywords: Big Data, Cloud database, Ant colony algorithm, premature convergence, scaling out

A Aitmagambetov, Yu Butuzov, S Torekhan Matters of satellite queuing network design in K_a -band for Republic of Kazakhstan

Computer Modelling & New Technologies 2014 18(2) 166-169

This work was carried out within the framework of research opportunities of using K_a - band satellite communication systems in the Republic of Kazakhstan. The paper deals with the multi-beam coverage in Kazakhstan (the distribution of beams in area and determine their capacity), as well as evaluation of the main parameters of subscriber channels. The need for this research was due to the fact, that the design of multibeam network for Kazakhstan is important to consider a distinct uneven distribution of the population (or potential users), low average density (about 6 persons / sq km.) and a fairly significant differences rain intensity in some areas of the territory.

Keywords: satellite networks, K_a -Band, multi-beam antennas, bandwidth, signal-code constructions

Operation research and decision making

R Uskenbayeva, B Kurmangaliyeva, N Mukazhanov Development of multidimensional model of data for information and analytical decision-making support system

Computer Modelling & New Technologies 2014 18(2) 170-174

Today almost in all spheres of industry it is observed the urgent need of information technologies development and increase of using opportunities. This paper is devoted to creation of multidimensional model of data for information and analytical system of decision-making support for management. The information and analytical system is developed by means of OLAP technology (On-Line Analytical Processing) which in turn analyses collected materials at a real time based on strategic level of solution. In information systems this technology displays data in the form of a multidimensional cube, and necessary data for users will be expressed in the form of cube slices. The multidimensional model of data is developed for information system intended for decision-making support of higher education institutions management.

Keywords: Multidimensional model of data, data warehouse, hypercube, dimension, higher education

Shangyao Shi, Shiping Zhao, Jun Li On tracking ability analysis of linear extended state observer for uncertain system

Computer Modelling & New Technologies 2014 18(2) 175-179

It is known that the linear active disturbance rejection control (LADRC) is very an effective approach to control the uncertain systems. The linear extended state observer (LESO) is the major link of the LADRC, so this paper presents a modified LESO, which is used to track the state variables and estimate the unknown total disturbance. Furthermore, this paper redefines the "time-scaling" of the plant, which is a function with respect to the amplitude of the unknown total disturbance. It is first time to present the specified formula of the maximum sampling-period of LESO for some existing plants. On the another hand, the tracking ability of the designed LESO is quantitatively described in this paper. The discussions and analysis, especially the quantitative formulas presented in this paper, will help the scholars and engineers to design the LESO in practice.

Keywords: LADRC, LESO, Modified LESO, "Time-Scaling", Sampling-Period

Wei Shang, Maozhu Jin, Jie Wang Using genetic algorithms on service facilities layouts design*Computer Modelling & New Technologies 2014 18(2) 180-185*

Traditionally, the objective of a service facility layout problem is to minimize the material handling cost and optimize the physical spaces that support a productive activity of the service system. Service delivering interface has direct impact to the efficiency and effectiveness of service system in light of customer's contact. Layout problem of service facilities has received little attention in the literature. Due to complexity and combination of the facility layout problems, the genetic algorithm is put forward that codifies a chromosome and uses a direct representation to assign the departments to the different branch areas, enables good solutions to be justified in real instances of the problem in tourist service centre. The solution is shown on a decision plan representing the graphic layout of the departments within the service facility. This application is highly flexible that the decision maker can accordingly define the departments' number to be accommodated, facility sizes, segment sizes, and algorithm parameters to be added or simplified.

Keywords: Layout design, Service facility, Genetic algorithm, Tourist service centre

Wu Shimei, Pei Yulong, Cheng Guozhu Method of traffic zone division based on spectral graph theory*Computer Modelling & New Technologies 2014 18(2) 186-191*

Aiming at the macro planning of traffic district division, the spectral graph theory, graph, spectral and matrix (i.e. Laplace matrix) were introduced, and the method and procedures of the traffic zone division based on spectral graph theory were put forward. Euclidean distance between communities was calculated according to four indexes, i.e., economic indicators, land development intensity, residential population quantity and spatial distance. The balance degree of indexes between communities was regarded as criterion to evaluate community division precision. Taking Dongguan, a city in the south China, as an example, above mentioned method was applied, conducting the traffic zone division, with rail transit network planning flow prediction.

Keywords: Traffic zone division, Spectral graph theory, Euclidean distance, Dongguan

Yanghe Feng, Baoxin Xiu, Zhong Liu A dynamic optimization model on decision-makers and decision-layers structure (DODDS) in C2-organization*Computer Modelling & New Technologies 2014 18(2) 192-198*

The highly-complexity, environmental uncertainty, and structure changes bring more requirements for the agility and resilience of its core command and control C2-organizations. In order to better understand such organization's dynamic and emergence behaviours as a system of systems, we establish time-domain based metric model to evaluate C2 organizational decision-making capability. We develop an optimization model of organizational structure. The model is based on decision-makers and decision layer dynamics. The model aims at helping gain an optimal organizational structure with higher operational flexibility, low cost and high performance.

Keywords: Operational System of Systems (SoS), Command and Control, Adaptive Optimization, Simulated Annealing

Zhao Suxia, Yang Xuemei, Sun Peihong Research on the method of determining the service scope of civil airport – the case of Chengdu Shuangliu airport*Computer Modelling & New Technologies 2014 18(2) 199-204*

Airport hinterland is the most important of influencing factors for civil aviation airport layout. By using methods of breaking point, expert consultation and entropy weights, the formula of computing the acting radius for airport hinterland was set up according to breaking point theory, and the idea and method were proposed to determine the service scope of an airport in an economic region. Then demonstrate the rationality of airport layout in the Chengdu-Chongqing economic zone by calculating the actual case of airport in the Chengdu-Chongqing economic zone. And get a conclusion that Leshan airport is inappropriate expansion in the near future.

Keywords: Civil airport, Breaking point theory, Entropy weights, Service scope

Liu Zhusheng Tourist flow-control study based on utility*Computer Modelling & New Technologies 2014 18(2) 205-211*

The key to solving tourist congestion during peak seasons is to improve the level of management and control the tourist flow in a scientific manner. Scenic capacity is usually set to a fixed value. Consequently, many plans have been developed, but have often produced poor results in practice. The utility concept in economics was introduced in this

study, according to the law of diminishing marginal utility; then a scenic spot utility function was proposed. With the aim of maximizing the utility value, a mathematical programming model was developed. Through the process of solving the example problem, it was shown that, in a certain number of tourists, scenic managers can optimize each visitor route to upgrade the tourist experience by effectively managing the flow of visitors.

Keywords: utility, tourist flow control, scenic management, tourism modelling

Liu Caihong, Xiong Wei The agent – based warning modelling of internal quality risks in supply chain for manufacturer

Computer Modelling & New Technologies 2014 18(2) 212-220

With the dynamic of market and deepening competing, enterprises will to be faced with much uncertain quality risks in supply chain. At present, the quality risk has been seen as one of the most important risks of supply chain, which is the most difficult to prevent and manage. To do it, the entities-attributes model based on the business of manufactures was used as the reference data sources of building evaluation index system for internal quality risks of supply chain. Because the early warning of risks manually has the limits of information insensitivity and risks identification slowly, this is apt to cause the delay of risks precautions. Therefore, the intelligent Agent based modelling method will be applied to construct the four early warning situations based warning model according to the internal risk of supply and demand for manufacturers. In addition, the evaluation algorithm, the rules of early warning and the running process for this Agent were focused in the study. This study will play a reference role to the analysis and management on the quality risks of supply chain.

Keywords: Quality risks, Supply chain (abbr. SC), Agent, Manufacturing enterprise, Early-warning modelling

Cong Guodong A study on the lock-in risk in IT outsourcing projects: the mechanism and the control system

Computer Modelling & New Technologies 2014 18(2) 221-226

This paper, proposes an insight into the mechanism of lock-in risk, which is the primary risk and the greatest concern in managing IT outsourcing projects. Based on Transaction Cost Theory (TCT), it develops an integrated three-layer model to instruct the mechanism of lock-in risk, namely, what will lead to lock-in risk (risk drivers), and what lock-in risk will result in (risk consequences). Four risk drivers such as asset specificity and three risk consequences such as cost escalation are identified and discussed in detail. Meanwhile, it instructs why four kinds of control could mitigate lock-in risk both from the sources and the consequences. Therefore, the effectiveness and reliability is enhanced throughout the risk management process of IT outsourcing projects, particularly for dynamic risk identification, controlling and monitoring.

Keywords: project management, lock-in risk, IT outsourcing, risk management

Bingjie Li A game theory analysis - dumping by multinational company and antidumping in China

Computer Modelling & New Technologies 2014 18(2) 227-231

Based on a dynamic game model, this paper analyses dumping by multinational firm and Chinese government's antidumping behaviour. It is shown that no matter how many products are dumped in domestic market; Chinese authority should impose punitive damages against the foreign firm as long as the scale of antidumping duty is not too high to stop multinational company's investment. This strategy will improve social welfare.

Keywords: Multinational company, Dumping, Antidumping, Game

Zhihong Ma, Jianping Chen, Shouzhen Zeng A new method based on induced aggregation operator and distance measures for fuzzy decision-making

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In this paper we introduce a new fuzzy decision making model that unifies induced aggregation operators and distance measures in the same formulation. We develop the fuzzy induced generalized ordered weighted averaging distance (FIGOWAD) operator. The main advantage of this operator is that it provides a parameterized family of aggregation operators between the minimum and the maximum and a wide range of special cases. Another advantage is that it is able to deal with the fuzzy environment where the information is very imprecise and can be assessed with interval numbers. Moreover, it uses induced aggregation operators that provide a more general representation of the attitudinal character of the decision-maker. We study some families of the FIGOWAD operators. We end the paper with an

application of the new approach in a business decision-making problem about the selection of strategies.

Keywords: Fuzzy numbers, induced aggregation operator, distance measure, decision making

Bi Jianxin, Lei Lianghai Analysis on the effectiveness of China's macro-economic policy based on the modified mundell-fleming model during the post-financial crisis period

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This paper proposed the hypotheses of Mundell-Fleming model applicable to current Chinese economic environment, modified the traditional Mundell-Fleming model and analysed the effectiveness of fiscal and monetary policies under different exchange rate systems. Under a fixed exchange rate system, the monetary policy causes economic instability and aggravates economic inequality, thus increasing the difficulty in policy intervention, in which case the fiscal policy has significant results only with the positive coordination of monetary policy; under a floating exchange rate system, the fiscal policy has remarkable effects and the monetary policy has effects which are not uncertain. Finally, the paper analyses the effectiveness of China's macroeconomic policy using the modified Mundell-Fleming model and proposes the orientation for China's macroeconomic policy in post-crisis period.

Keywords: Mundell-Fleming Model, Sub-prime Mortgage Crisis, Financial Crisis, Fiscal Policy, Monetary Policy

Sheng Yao, Longshu Li Approximation reductions in an incomplete variable precision multigranulation rough set

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This paper deals with approaches to the granular space reductions in the variable precision multigranulation rough set model. The main objective of this study is to extend four kinds of the granular space reductions called a tolerance relations optimistic multigranulation β lower approximation distribution reduction, a tolerance relations optimistic multigranulation β upper approximation distribution reduction, a tolerance relations pessimistic multigranulation β lower approximation distribution reduction and a tolerance relations pessimistic multigranulation β upper approximation distribution reduction, which preserve the optimistic/pessimistic multigranulation β lower/upper approximation distribution of the decision classes. Some judgement theorems are investigated. The example proves that the new variable precision multigranulation rough set model can effectively deal with incomplete information, from which we can obtain approaches to the granular space reductions of incomplete decision systems in variable precision multigranulation rough theory.

Keywords: Approximation Reduction, Tolerance Relation, Variable Precision Rough Set, Multigranulation

Wang Hongbao Cost-sensitive back-propagation neural network for financial distress prediction

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Financial distress prediction (FDP) models, which classify financially distressed companies from healthy ones, prevent market participants from suffering economic loss. In the process of FDP, the misclassification of type I error of the model incurs much higher cost than that of type II error. Most of the previous FPD models do not take the asymmetric costs into consideration. In this paper, cost-sensitive back-propagation neural network (CS-BPNN) FDP model is proposed for minimizing the cost of prediction error such that the loss of users of the model will suffer less. The performance of the model is evaluated by taking 180 Chinese listed companies as sample data and adopting 8 times of sampling to assess different misclassification costs and prediction accuracy. The experimental results suggest that the proposed approach helps to improve the prediction performance in asymmetric cost setup.

Keywords: Financial Distress Prediction (FDP), Cost Sensitive Learning, Back-propagation Neural Network (BPNN), Cost of Prediction Error, Cost-sensitive Back-propagation Neural Network (CS-BPNN)

Shaoren Wang, Zujun Ma, Bochao Zhuang Fuzzy location-routing problem for emergency logistics systems

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To optimize the post-earthquake emergency logistics system with two-echelon multi-facilities, this study develops a model for fuzzy location-routing problem by considering fuzzy demand of relief materials, timeliness and limited resources. The goal of the model is to minimize the total cost and the relief time of system. Furthermore, this research proposes an improved genetic algorithm based on weighted coefficient transformation. The result of a numerical example shows that the model and algorithm are effective for resolving the joint decision-making of facility location-

allocation problem and vehicle routing problem in post-earthquake.

Keywords: Emergency Logistics, Location-routing Problem, Earthquake Disasters, Multi-objective Optimization, Improved Genetic Algorithm

Peizhe Li, Lirong Jian, Kun Zhang, Shanshan Pei Evaluation of regional economic development level based on grey clustering and rough set

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The evaluation result of regional economic development is an important basis for government to make regional economic development planning, scientific regional economic development evaluation system and method has an important significance for understanding the regional economic development. Using grey clustering to classify different regions by the new evaluation index system, and using the rough set theory to derive fuzzy decision rules, these rules can explain the preference behaviour of decision makers and provide scientific and rational decision-making suggestions.

Keywords: Regional economic, Grey fixed weight clustering, Dominance rough set, Evaluation, Decision rules

Zhan'an Zhang, Xingguo Cai Power purchase plan using minimal cost flow

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The minimal cost flow method presented in this paper is used to calculate the minimum power purchase cost, because the user's goal is the minimal power purchasing cost under open electricity market. By establishing the minimal power, purchasing cost model and using the minimum cost flow algorithm to solve the objective function, the method is used to calculate a network in a single time. A continuous period of power purchase plan is obtained by accumulating each period network flow together. Example analysis proves that it is feasible to solve the problem with the minimal cost flow algorithm.

Keywords: Power Purchase Cost, Minimal Cost Flow, Network, Electric Market, Power Purchase Plan

Innovative Education

Tatyana Koycheva Novel approaches to form the corporate culture in pedagogical universities

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The role of a corporate culture in the development of the modern education, especially in the improvement of the university education is considered. On the example of pedagogical university it's shown that the active research work promotes the formation of a corporate culture within the educational institution. At the same time an availability of the corporate culture leads to the expansion and intensification of scientific work. As a result of our research it was confirmed a particular importance of scientific schools and international consortiums in the formation of a corporate culture.

Keywords: corporate culture, pedagogical universities, research work, scientific schools