

Cumulative Index

Mathematical and Computer Modelling

Jun Liu, Xing He, Qingyou Liu, Jiang Naibin, Huang Chen Vibration-modal analysis model for multi-span pipeline with different support conditions*Computer Modelling & New Technologies 2014 18(5) 7-13*

Vibration characteristics analysis is important in the design of multi-span pipeline with different support conditions. In order to analyse the natural frequency and the vibration modal of the multi-span pipeline, a matrix transfer method is proposed in this paper. With the multi-span pipeline divided into single-span pipes, the transmission formulas for the deflection, angle, bending and shear between two adjacent spans are deduced, in combination with the Krylov function solution of the free vibration equation for the single-span pipe, and the constraint condition between the two adjacent spans of the multi-span pipeline. According to the boundary conditions on the starting and ending spans, the natural frequency equation and the vibration modal function between two adjacent spans of the multi-span pipeline are presented. The FORTRAN program based on the above principle is written, and the natural vibration frequencies and the vibration modals of two typical multi-span pipelines are investigated and compared with the results from ABAQUS. It is shown that the model presented in this paper is efficient in the analysis of multi-span pipeline and has the advantages of high computational efficiency and convenience for engineering practice application.

Keywords: Multi-span pipeline, Vibration equation, Natural frequency, Vibration modal

Ni-qin Jing, Lin-na Wang The research of electromotor control based on optimized RBF neural network*Computer Modelling & New Technologies 2014 18(5) 14-18*

RBF neural network suits to control electromotors, which have uncertainty and highly nonlinear systems. However, in practice, RBF neural network also have some obvious defects. For example, the strong dependence on the initial parameter and the poor quality of clustering algorithm. For the above defects, this paper is going to build an optimized RBF neural network through the combination of ant colony optimization algorithms, chaos ergodicity optimization theory and traditional K-means algorithm. On this basis, the optimized RBF neural network will be applied to PID control and then the dynamic performance of the electromotor will be simulationally tested by the designed PID controller. The simulation results show that in the control of electromotor, the optimized RBF neural network has the characteristic of high control accuracy and strong traceability and also it has the ability to guarantee electromotor control system with steady and dynamic performance.

Keywords: RBF neural network, ant colony optimization algorithms, chaos ergodicity optimization, chaos ant colony optimization algorithms, electromotor control

Chang-liang Liu, Zeng-hui Ma, Ping-an Kai A universal tuning method of large dead-time system*Computer Modelling & New Technologies 2014 18(5) 19-23*

The current approach of the PID controller design and tuning for the large dead-time system are almost based on the first-order time delay model, such as all PID algorithms and Ziegler function in MATLAB. And these algorithms generally only apply to the following system $0.1 \leq \tau/T \leq 2$. Therefore, the application effect of these algorithms in large dead-time system are not ideal. Based on the second-order system, this paper proposed a universal tuning method of PID controller for large dead-time process. By the introduction of the controller pre-coefficient K_f , this method makes the large dead-time system PID controller design and tuning simplistic. The fitting formula of controller pre-coefficient K_f was given in this paper. The method is simple, versatile, suitable for the object of $(\tau/T) \rightarrow +\infty$ and second-order, higher-order system, overcomes the limitations of traditional PID control algorithm in large dead-time system applications. The simulation results show that the method is correct, effective and has practical value.

Keywords: dead-time system, PID controller, parameter tuning, second-order system, pre-coefficient

Wenjing Li Using grey-weighted Markov chain model to predict the quantum of highway passenger transport*Computer Modelling & New Technologies 2014 18(5) 24-28*

The grey-weighted Markov model is a prediction model integrating the advantages of grey model and Markov chain model. It can be applied to predict the highway passenger transport quantum. Compared with grey model, the grey-weighted Markov chain model improved the precise of prediction, so the combined model was more appropriate for the prediction of highway passenger transport. Based on the original data of highway passenger transport quantum from 2001 to 2011, the passenger transport quantum in 2012 was predicted with grey-weighted Markov chain model.

Keywords: Grey model, weighted Markov chain, passenger transport quantum, prediction

Hongyang Zhang Research on modelling of intake tower in three-dimension CAD software and simulation analysis in FE software*Computer Modelling & New Technologies 2014 18(5) 29-35*

ANSYS is one of the most influential finite element analysis software in the world because of its very powerful calculation and analysis ability, but its pre-process function is weak relatively. SolidWorks is the three-dimension parametric feature modelling software of 100% feature modelling and 100% parameterization, which provides product-level automated design tools. In this paper, combining with the intake tower, it discusses the method of modelling in three-dimension CAD software SolidWorks and the interface processing between SolidWorks and the ANSYS code, which decreases the difficulty in modelling complicated models in ANSYS. In view of the function of the birth-death, element and secondary development with APDL (ANSYS parametric design language), simulation analyses of thermal field and stress during the construction and impounding periods were conveniently conducted.

Keywords: Modelling in SolidWorks, interface processing, birth-death element, APDL, simulation analysis in ANSYS

Wenliang Yin, Maoqing Xiang Research on the operation modes of hydropower station based on complementary characteristics*Computer Modelling & New Technologies 2014 18(5) 36-43*

Including wind-PV-ES (Wind/Photovoltaic/Energy storage) hybrid power generation system into the scheduling system of grid is the development tendency of safe grid-connection and operation of large wind-PV-ES hybrid power generation system. To solve the active power control problems in hybrid power generation system, this paper analyzes genetic algorithm and quantum genetic algorithm, and also analyzes the importance of energy storing devices in scheduling. Based on this, an optimization model of active power in wind-PV-ES is established. With the expectation of power output fluctuation of the power generation system as the objective function, the optimal scheduling scheme for the model is sought through genetic algorithm and quantum genetic algorithm respectively. The results of Matlab experiment show that the optimal scheduling scheme obtained by means of quantum genetic algorithm is superior to the scheduling scheme obtained by means of traditional genetic algorithm.

Keywords: Hybrid power generation system, Power control, Genetic algorithm, Quantum genetic algorithm

Hai Liu, Jing Chen, Jian-yi Kang, Xiao-xia Li, Ivan Azhari Finite element analysis of the dynamic response of the cardiovascular system to the blunt ballistic impact*Computer Modelling & New Technologies 2014 18(5) 44-49*

On the basis of the Chinese Visible Human Dataset (CVHD), a three-dimensional human finite element model that includes skin, muscle, bone, the lungs, the heart and the vascular trunk was developed. In the LS-DYNA software environment, a numerical simulation of the blunt ballistic impact, which was caused by a 5.56-mm rifle bullet moving with the speed of 910 m/s toward a human torso wearing a composite body armor vest, was performed, and the stress and pressure response of the cardiovascular system were calculated. The simulation results demonstrated that the blunt ballistic impact introduced a high-frequency pressure response on the chambers of heart, which was characterized by a high amplitude and short duration. The peak values of the pressure waves, measured at the ascending aorta and superior vena cava ports, were 659.3 kPa and 542.8 kPa respectively, which suggested that the blunt ballistic impact

on the chest would result in injury to distant target organs through the cardiovascular system. The computational results of this model can provide a basis for predictions of heart injuries, in-depth studies of the mechanical mechanism of cardiovascular injuries to blunt ballistic impacts and further improvements in protective equipment.

Key words: blunt ballistic impact, cardiovascular system, dynamic response, finite element analysis

Nanjian Zhuang, Jinwu Xiang, Zhangping Luo, Yiru Ren Calculation of helicopter maneuverability in forward flight based on energy method

Computer Modelling & New Technologies 2014 18(5) 50-54

A new method for calculating helicopter maneuverability in forward flight is proposed. Empirical equations for evaluating rotor required power are employed. Using energy method, an algorithm to calculate the available overloads, rate of climb and flight trajectory is given. The maneuver performance of AH-1G helicopter is investigated and three kinds of maneuvers including level acceleration, deceleration turning and turning climb followed by accelerating climb are calculated and analysed. Numerical results indicate that the method is effective and feasible, even for three dimensional maneuvering problems. In addition, the method can be applied to predict flight trajectory during forward flight.

Keywords: Helicopter, Maneuverability, Energy Method

Shu Jie Liu, Ya Wei Hu, Chao Li, Hong Chao Zhang Residual life prediction under condition monitoring

Computer Modelling & New Technologies 2014 18(5) 55-60

Reliability assessment and remaining life prediction in the working processes of mechanical products, getting more attention of researchers, can reduce accidents and losses and help improve the preventive maintenance decision-making. This article presents two failure models, linear and exponential, to predict residual life distribution based on the degradation information of mechanical products. Parameters of the models can be estimated using maximum likelihood method. After the real-time monitoring information is acquired, residual life distribution should be updated constantly in order to improve accuracy of the prediction. Experiments were carried out on a double row cylindrical roller bearing to get the vibration information. It proved the validity of the aforementioned method and was applied to compare the two degradation models.

Keywords: reliability, residual life distribution, degradation model, double row cylindrical roller bearing

Qing Ma, Hua Yang, Chaogang Zhang, Zhaohui Peng Effects of global warming for building energy demand in China

Computer Modelling & New Technologies 2014 18(5) 61-65

The impact of global warming on building energy demand in China was investigated by means of whole building energy analysis model and hourly weather data. Four standard multi-story office-building models, representative of four typical climate locations were constructed. For the time period 2050–2100, the climatic temperature scenario models for four typical cities was used that foresees a 2.7-4.2 °C rise in mean annual air temperature relative to the period 1961–1990 normal temperature and is thereby roughly in line with the climate change predictions made by the Intergovernmental Panel on Climate Change (IPCC). The simulation results show that the annual cooling energy demand for office buildings with internal heat gains of 20–30 W/m² will increase by 26-58% while the heating energy demand will fall by 17-52% for the period 2050–2100. This study has also shown that the typical meteorological year (TMY) currently in use by building designers and HVAC engineers in China will lead increasingly to an overestimation of heating energy demand. Similarly, the use of TMY to compute cooling power and cooling energy consumption is likely to result in a progressive underestimation of the future demand. The future building energy demand is set to become a crucial design issue.

Keywords: Global warming, Heating energy, Cooling energy, TMY, Temperature scenarios, Typical office building model

Weijun Cheng On the error rate analysis of dual-hop relaying over composite fading channels using mixture gamma distribution

Computer Modelling & New Technologies 2014 18(5) 66-72

In this paper, we present the end-to-end performance of a dual-hop amplify-and-forward (AF) relaying system over independent non-identical (non-i.i.d) composite Nakagami-lognormal (NL) fading channels by using mixture gamma (MG) distribution. Novel closed-form expressions for the probability density function (PDF) and the moment-generation function (MGF) of the end-to-end signal-to-noise ratio (SNR) are derived. Moreover, the average error rate and the diversity order are found based on the above new expressions, respectively. These expressions are more simple and accuracy than the previous ones obtained by using generalized-K (KG) distribution. Finally, numerical and simulation results are shown to verify the accuracy of the analytical results. These results show that it is more precise to approximate the composite NL distribution by using the MG distribution than using the KG distribution in the performance analysis of cooperative relaying systems.

Keywords: Dual-hop Relaying, Nakagami-lognormal, Mixture Gamma Distribution, Error Rate Analysis

Computer and Information Technologies**Gaochao Xu, Peng Liu, Xiaodong Fu, Yunmeng Dong, Jia Zhao, Yan Ding** A novel task deployment approach based on graph theory for power saving

Computer Modelling & New Technologies 2014 18(5) 73-78

With the increasing of the big datacenter, the power consumption seems to be another overhead except the equipment cost. Saving the power of big datacenter is the hotspot now. In this paper, we proposed TA-BG algorithm based on the linear weighted and graph theory to speed up the execution of tasks. Firstly, utilizing linear weighted to execute first filter to reduce the searching scope for the next research. Secondly, seeking out the hosts that can execute tasks fast based on graph theory. Finally, placing the host on the hosts selected above. The experiments indicate that TA-BG can save power of datacenter by reducing the executing time. Besides, the TA-BG even performs well on load balance.

Keywords: Cloud Data Centre, Task Allocation, Power Saving, Graph Theory

Juncheng Li Image enlargement based on the hyperbolic Coons interpolation

Computer Modelling & New Technologies 2014 18(5) 79-85

A method for image enlargement, making use of the hyperbolic Coons interpolation surface with shape parameters, is investigated in this paper. As a non-polynomial model, the hyperbolic Coons interpolation surface can represent the image better than the general interpolation methods. By altering the values of the shape parameters, the effects of image enlargement can be adjusted until achieving the satisfactory results. Experimental results show that the effects of image enlargement making use of the hyperbolic Coons interpolation surface are better than the general interpolation methods.

Keywords: image enlargement, hyperbolic Coons interpolation surface, shape parameters

Yiping Shen, Shuxiao Li, Chengfei Zhu, Hongxing Chang A fast top-down visual attention method to accelerate template matching

Computer Modelling & New Technologies 2014 18(5) 86-93

This paper presents a fast top-down visual attention method to downsize the search space of template matching. Such a method first generates patterns representing the local structures, and then calculates the pattern distributions representing the template and its surroundings. From here two separate operations are performed: the "pattern weight" is first introduced, which describes how well a certain pattern is correlated to the template, and then weights of all patterns are calculated for later reference. This is the "off-line" operation, and in comparison the "on-line" operation only calculates the pattern of each pixel, whose weights can be indexed conveniently from the off-line results. With all pixels' pattern weights calculated, the weight image is ready, from which we can extract the region of interest for subsequent matching. Experiments showed that our method obtained at least 6.21 times speed-ups over the state-of-the-art methods with little or no loss in performance.

Keywords: template matching, visual attention, top-down attention, saliency, region of interest

Weidong Tang, Jinzhao Wu, Meiling Liu Step semantics and action refinement in event structures*Computer Modelling & New Technologies 2014 18(5) 94-101*

An event structure acts as a denotational semantic model of concurrent systems. Action refinement is an essential operation in the design of concurrent systems. However, there exists an important problem about preserving equivalence under action refinement. If two processes are equivalent with each other, we hope that they still can preserve equivalence after action refinement. In linear time equivalence and branching time equivalence spectrum, step equivalences, which include step trace equivalence and step bisimulation equivalence are not preserved under action refinement [17]. In this paper, we define a class of concurrent processes with specific properties and put forward the concept of clustered action transition, which ensures that step equivalences are able to preserve under action refinement.

Keywords: event structure, action refinement, concurrency, step equivalence, clustered equivalence

Xianfeng Yang, Yan Wang A research into static traffic routing and resource optimization algorithm based on genetic and tabu search*Computer Modelling & New Technologies 2014 18(5) 102-110*

In order to solve the issue of optical network's static traffic routing and resource optimization, this paper puts forward a hybrid genetic and tabu search virtual reconfiguration algorithm (HGTS-VRA) and designs the key elements. This algorithm could effectively integrate the large scale searching ability of genetic algorithm and the outstanding local searching ability of tabu search algorithm. The simulation comparison result and analysis result show that the HGTS-VRA put forward by this paper enjoys excellent advantages in the field of traffic routing and resource optimizing. In addition, it offers outstanding extendibility and robustness.

Keywords: Hybrid Genetic, Tabu Search, Static Traffic Routing, Resource Optimization

Xianmin Wei, Hong Lu, Hong Feng ABMP: adaptive bitmap protocol within TDMA for mobile underwater sensor networks*Computer Modelling & New Technologies 2014 18(5) 111-117*

Media access control (MAC) protocol design is one of hot topics in the research of underwater acoustic sensor networks (UWSN). The major challenge is the phenomenon of space-time uncertainty caused by the long delay in underwater signal propagation, where the occurrence of frame conflict is determined by not only two nodes' transmission time, but also by their locations. In this paper, the adaptive bitmap protocol-based (ABMP) within time division multiple access (TDMA) was proposed for UWSN, with specialized space-time uncertainty among mobile underwater nodes reducing channel idle time and improving energy efficiency and transmission efficiency. Finally, simulation experiments are conducted to present that the proposed protocol has better communication efficiency and energy efficiency, compared with other MAC protocols of Token-TDMA and T-lohi in terms of network traffic, end-to-end delay and energy efficiency.

Keywords: Underwater sensor networks, Adaptive bitmap protocol, Media access control, Time division multiple access

Hong Li, ZongZhe Wang Design of grey PID controller for DC Servo Motor*Computer Modelling & New Technologies 2014 18(5) 118-123*

Concerning the uncertainties may be existed in DC motor servo system and the control quality that the external disturbance may influence the control algorithm of traditional PID, a kind of PID control algorithm based on grey prediction theory was proposed. With the grey theory's processing ability on the unknown information data, the algorithm established the grey model for the uncertainties, and real-time compensated the system's unmodelled feature and disturbance signal, thus improving the control precision. The simulation result can show that the proposed PID control algorithm based on grey prediction theory can effectively predict and compensate the unmodelled feature and disturbance signal in DC motor servo system and improve the control precision of the controller, thus providing the theoretical basis for the industrial application of PID control algorithm based on grey prediction theory.

Keywords: PID control, DC motor, Noise, Disturbance, Grey prediction

Bingqian Chen A new automatic registration method for InSAR image based on multi-step strategy*Computer Modelling & New Technologies 2014 18(5) 124-130*

Interferometric Synthetic Aperture Radar (InSAR) technology has been widely used in various applications. The registration of SAR (Synthetic Aperture Radar) images is the first step in interferometric processing therefore accurate registration is essential for the successful creation and interpretation of interferometric products. However, with the growing number of SAR satellite launch and the amount of data acquisition, the degree of automation of image registration have become increasingly demanding. In this paper, we propose an automatic registration approach based on multi-step matching strategy. In the first step, key points are detected and matched using modified scale invariant feature transform (SIFT) operator which modified by us reducing the influence of speckles. In this step, owing to the existing of speckle and the defect of matching strategy of SIFT operator, the expected level of matching accuracy is about 2 to 3 pixels. In the second step, correlation matching (CM) is used to exclude the matched points with low correlation. In the third step, the probability relaxation (PR) algorithm based on global matching is used to induce consistency constraint and ensure reliability of the matching result. Finally, corresponding transformation function is determined through the relationship established by matched point pairs. In order to verify the applicability of proposed methodology, two SAR images acquired over mountainous regions are used in our experiment. The experiment results show that subpixel registration accuracy and good efficiency have been achieved, which demonstrates the correctness and feasibility of proposed method.

Keywords: InSAR, Image registration, Feature detection, SIFT, Correlation matching

Lirong Qiu An approach for reference model implementation by predicting all possible output of design*Computer Modelling & New Technologies 2014 18(5) 131-137*

In verification system, it is preferable to build reference model at transaction level which does not produce the output as the same latency as the design itself. But due to the lack of accurately modelling design's behaviour, there are some scenarios that design's output is different with reference model's output due to the different processing delay of stimulus. Scoreboard can get lots of comparison failure when it tries to do comparison between the output of reference model and design under such scenarios. In this case, neither reference nor design is wrong from functionality, but output comparison failure will mix up with the true design issue and bring trouble to the automatic check on design's behaviour. Cycle based reference model does not have such problem. But it usually takes great effort to implement cycle based reference models and maintain them. This paper provides its study on implementation style of reference model. By predicting all possible output of design, this paper presents a method for reference model to handle such stimulus competition scenarios at the transaction level. The paper also discusses the reference model's reaction effect on generator, which helps the test hit design's corner case.

Keywords: System Verilog, reference model, scoreboard, competition stimulus, coverage driven verification

Rong-chun Wu, Feng-li Zhang, Jin-bang Zhang, Qian He Application of fuzzy comprehensive evaluation in weapon equipment systems*Computer Modelling & New Technologies 2014 18(5) 138-142*

Analysis and evaluation of the operational effectiveness of weapon equipment operational systems has always been a complex problem, a study of its evaluation technology is of great significance. Task oriented operation, this paper discusses equipment operational system dynamic integration needs, and discusses the steps and comprehensive performance evaluation method of weapon equipment operational system, made a fuzzy comprehensive evaluation method to better adapt to comprehensive performance evaluation of weapon equipment operational system. According to the characteristics of system evaluation factors, and gives an indicator of quantitative methods established based on analytic hierarchy process and correlation analysis of comprehensive performance evaluation model, based on three types of weapon equipment operational system data, for example, proves the validity of the method.

Keywords: Weapon Equipment Systems, Comprehensive Performance, Combat Effectiveness, Multi-level Fuzzy comprehensive evaluation

Operation research and decision making**Yingjun Zhang, Xuefeng Yang** Expert system based on fuzzy rules for maritime search and rescue*Computer Modelling & New Technologies 2014 18(5) 143-148*

Search and rescue (SAR) plan decides the result of SAR activity, and relates with the safety of life and property at sea. To improve the efficiency and standard of SAR, and give the SAR officer support to make better decisions, expert system (ES) is been researched by this paper, and the ES based on fuzzy rules for maritime SAR is proposed. Firstly, the structure of ES based on fuzzy rules for SAR is designed. Secondly, we have researched SAR knowledge acquisition and knowledge representation, chosen five ways to acquire SAR knowledge. At last, we designed the inference engine of ES for SAR, and introduced it in an example.

Keywords: fuzzy rules, expert system, supporting system, search and rescue

Jun Luo, Sijing Cai, Yanhui Wang Research on dynamic risk identification model of shield tunnelling based on REASON model*Computer Modelling & New Technologies 2014 18(5) 149-154*

Aiming at the dynamic risk identification problem in shield tunnelling, and with the lack of research on dynamic risk identification theory and human factors in shield tunnelling, an analysis model of shield tunnelling based on REASON model has been proposed to establish in this paper. Relying on the fault tree theory and the model that established, the accident rule base has been built. After forming the REASON model into a network, the dynamic risk identification model for shield tunnelling has been built to provide theoretical guidance for dynamic risk management during the construction.

Keywords: Shield tunnelling, REASON model, dynamic risk identification model, risk management

Yanming Ye, Yueshen Xu, Zhilin Feng Tag-based process recommendation for social business process modelling*Computer Modelling & New Technologies 2014 18(5) 155-161*

Social BPM (Business Process Management) has become a new research hotspot in business process management field because of its capability of handling the flexibility and dynamics of process in social circumstance by means of integration of social software and BPM. The key technique is process modelling, and note worthily the process modelling is more complex in social BPM than in traditional BPM. This paper presents the definition of social business process model to identify the difference with the traditional business process model and gives a prototype of social BPM system. The modeller in the prototype system may be a common user without professional knowledge, so a tag-based process recommendation method is proposed to facilitate modelling. The experiment result shows that the method is valid and effective in computer-aided intelligent process modelling.

Keywords: process recommendation, process modelling, social business process model

Jin Wang, Weidong Zhu The impact of capital structure on corporate performance based on panel threshold model*Computer Modelling & New Technologies 2014 18(5) 162-167*

This paper takes Value Added as an indicator of corporate performance. In considering the case of differences in growth opportunities, we use Panel Threshold Model to do an empirical analysis in the relationship between environmental management, capital structure and corporate performance of listed companies in China. The results show that: There is a weak positive correlation between environmental management and corporate performance, which means environmental management can improve corporate performance; there is a significant regime effects between capital structure and corporate performance relying on corporate growth opportunities. Capital structure and corporate performance are negatively related for low growth companies and positively related for high growth companies. This is consistent with the classical theory of capital structure, which means Value Added is more suitable as an indicator of corporate performance than profits in China.

Keywords: Panel Threshold Model, Value Added, Environmental Management, Capital Structure, Growth Opportunities

Hong Zhang Short-term prediction of wind power based on self-adaptive niche particle swarm optimization*Computer Modelling & New Technologies 2014 18(5) 168-173*

Connecting wind power to the power grid has recently become more common. To better manage and use wind power, its strength must be predicted precisely, which is of great safety and economic significance. Speed sensors are widely applied, it make prediction of wind power more accurate. In this paper, the short-term prediction of wind power is based on self-adaptive niche particle swarm optimization (NPSO) in a neural net. Improved PSO adopts the rules of classification and elimination of a niche using a self-adaptive nonlinear mutation operator. Compared with the traditional method of maximum gradient, NPSO can skip a local optimal solution and approach the global optimal solution more easily in practice. Compared with the basic PSO, the number of iterations is reduced when the global optimal solution is obtained. The method proposed in this paper is experimentally shown to be capable of efficient prediction and useful for short-term power prediction.

Keywords: Speed sensor, PSO, Niche, Short-term power prediction, Neural net

Chengmeng Xue, Yu Yang, Tao Yang, Tingting Zeng Person-organization fit evaluation and process optimization based on the matching theory*Computer Modelling & New Technologies 2014 18(5) 174-180*

To achieve an optimal bidirectional person-organization fit (P-O fit) and improve the overall satisfaction degrees for both of the two sides, a bidirectional P-O fit evaluation and process optimization model is established based on the Matching Theory in this paper. To begin with, the bidirectional P-O fit evaluation factors set is built after the analysis of the indexes of these factors, and the index weights are calculated with the Rough Set Theory; Then, a Bidirectional P-O fit Evaluation and Process Optimization Model is proposed, with the Fit Conflict Resolve Algorithm (CRA) to ensure the persons and organizations to be matched one-to-one; Finally, the validity of this model is verified by its implementation in the enterprise HXMS.

Keywords: persons and organizations, bidirectional fit, fit degree, Cauchy Distribution Function

Jinling Li, Haixiang Guo, Yan Chen, Deyun Wang, Kejun Zhu An artificial fish swarm algorithm for solving a bi-objective capacitated vehicle routing problem*Computer Modelling & New Technologies 2014 18(5) 181-190*

The paper focuses on a capacitated vehicle routing problem with two objectives: one is attainment of specific load factor and the other is minimization of total travel cost. Our approach is based on artificial fish swarm algorithm, a swarm-based heuristic, which mimics the foraging behaviour of a fish swarm. After initializing a school of artificial fish, whose validity is guaranteed by a designed repair operator, global optimal solution search is processed through random behaviour, prey behaviour, swarm behaviour, and follow behaviour. Experimental results for a practical distribution instance are reported and show that the artificial fish swarm algorithm performs better than sweep algorithm and genetic algorithm. This paper contributes to the solution methods of vehicle routing problem.

Keywords: Vehicle routing problem, Artificial fish swarm algorithm, Sweep algorithm, Genetic algorithm

Lijuan Wang, Song Jin, Tianwei Zhang, Peter Chung Analysis of price rate models for household water consumption in urban China*Computer Modelling & New Technologies 2014 18(5) 191-195*

Price rate models are used for a variety of purposes including water conservation, what's more, it is an effective and feasible method to establish a water-conserving society. The survey of household water consumption was conducted in a residential community in Hebei Province. An analysis of the survey data shows that an average family's water consumption is 6.4t per month, the standard is level 3. Three price rate models are proposed, the principle of the first model is the decrease of water consumption in level 1 and no increase in level 2, the second model is no change in level 1 and an increase in level 2, the third model is no increase for 80% of families and only 20% increased. After an analysis and comparison of water consumption and expenses corresponding to the three models, this paper presents

these three models as a valuable reference for department decisions. The results of the first model should be adopted in Hebei Province, the demarcation point of every level is 8t and 13t, the price of every level is 3.04 RMB/t, 4.56 RMB/t and 9.06 RMB/t.

Keywords: Price rate model, Resident water consumption, Data survey, Water conservation

HaiLei Zou, Cheng Wang Calculation of China's environmental efficiency based on the SBM model with undesirable outputs

Computer Modelling & New Technologies 2014 18(5) 196-200

With the rapid development of china's economy, the environment of china faces some prominent questions, industrial pollution, water pollution, serious smog and other problems continue get worse, therefore, it's very significant to analyse China's regional environmental efficiency. This paper mainly measure china's regional environmental efficiency by SBM model with undesirable outputs, and according to the calculation results, we find that the overall average level of china's environment efficiency is low, and the gap between different provinces is large. Finally, this article gives some policy proposal about how to increase china's environmental efficiency and reduce pollution emission.

Keywords: Environmental Efficiency, SBM Model, Undesirable Outputs

Zhaoxia Si, Shaoliang Zhang, Ningli Chen Correlation model analysis on the land price fluctuations in Beijing and Tianjin City in China

Computer Modelling & New Technologies 2014 18(5) 201-207

According to the indexes of the city land price, the co-integration analysis, the Granger causality test, the impulse response function and the variance decomposition method were used in this paper to analyse the correlation model of the land price fluctuations in Beijing and Tianjin city in China. The results showed that the land prices in Beijing and Tianjin city had a long-term co-integration relationship. The Granger test model showed that the land prices in Beijing and Tianjin city was in line with positive correlation bidirectional causality. In addition, the raise of 1% land price in Beijing city caused a raise of 0.96% in Tianjin city. Conversely, a raise of 1% in Tianjin city caused a raise of 1.03% in Beijing city. By comparing the mutual influence degree, the land price fluctuations in Beijing city had a greater influence on that in Tianjin city.

Keywords: Land price fluctuation model, Co-integration test, Granger causality model, Impulse response function

Haiyan Yi, Dianjun Fang Dynamic evaluation and simulation of variant-driven complexity costs in multi-echelon automotive supply chains

Computer Modelling & New Technologies 2014 18(5) 208-219

The proliferation of product variety driven by part variants imposes a great impact on the costs, performance and ecological burden of automotive supply chains. Costs are always the first aspect to be considered by manufacturers. This paper creates a multi-echelon automotive supply chain in the light of the process model and improves the KPI of low costs to evaluate the variant-driven complexity costs. Then, the evaluation models of different complexity costs are constructed. An automotive supply chain scenario model is constructed with the OTD-NET and the simulation results are analysed. The study of this paper will be helpful to automotive manufacturing in seeking to optimize the number and range of product variants.

Keywords: Automotive Supply Chain, Product Variety, Complexity Costs, OTD-NET

Chenghu Yang, Lanying Liu, Lei Zhang Optimal acquisition and pricing policies for remanufacturing systems with initial investment

Computer Modelling & New Technologies 2014 18(4) 220-225

The problem of used product (core) acquisition is an important issue in remanufacturing. In traditional models, remanufacturing systems are assumed to be well-established. However, remanufacturing systems in most developing countries are imperfect and remanufacturers need to make huge initial investments to improve the remanufacturing

systems. It is therefore suggested that the effects of initial investment cannot be neglected. In this paper, an acquisition and pricing problem in imperfect remanufacturing systems is studied. The problem is firstly formulated as a two-period nonlinear programming model, and the closed forms of the optimal solution are presented based on Karush-Kuhn-Tucker conditions. Next, the multi-period acquisition and pricing problem, and the effects of the initial investment are discussed. Finally, the conclusions are testified by numerical examples. The results show that with the remanufacturing system improved, the remanufacturer will increase investment and acquire more cores.

Keywords: Core acquisition, Imperfect remanufacturing systems, Nonlinear programming model, Karush-Kuhn-Tucker conditions

Xing Yu Continuous-time optimal portfolio model with mean-reverting process

Computer Modelling & New Technologies 2014 18(5) 226-229

This paper studies a continuous-time portfolio optimization problem. It is proposed a simple but powerful approximation approach that is both accurate and computationally efficient for the terminal expectation of the investors with mean-reverting process, which is different from the existing literatures that apply the dynamic programming method. Numerical examples illustrate the computational efficiency and accuracy of our approach when compared with results from Monte Carlo (MC) simulations.

Keywords: Continuous-time portfolio, Mean-reverting process, Optimization; Monte Carlo

Nannan Duan, Fuyuan Xu, Ming Ni Evolutionary game analysis of enterprises' technological innovation strategies

Computer Modelling & New Technologies 18(6) 230-239

Different from general studies on competition and/or cooperation relationship of enterprises, the paper classified enterprises' technological innovation strategies into cooperation, neutrality and competition, and analysed the evolution of enterprises' relationship and strategy selection in technological innovation using the evolutionary game method and the MATLAB simulation technique. The paper drew the following conclusions: (1) the increase in technological content may cause two uncertain cases of enterprises' strategy, namely both parties chose the cooperation strategy, or one party chose the cooperation strategy while the other party chose the noncooperation strategy; (2) the increase in innovation revenue (coefficient) prompted enterprises to eventually tend towards the cooperative innovation strategy, no matter what the initial relationship between enterprises was; (3) the increase in the number of enterprises with the neutrality attitude promoted enterprise groups to tend towards cooperative innovation.

Keywords: technological innovation, evolutionary game, cooperation, neutrality, competition

NATURE PHENOMENA AND INNOVATIVE ENGINEERING

Lixiong Gong, Xiangsheng Kong, Yong Liu, Min Huang Subpixel edge extraction of part ant colony optimization-based and dimensional measurement

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Put forward a method combined improved ant colony and Zernike moment to detect image subpixel edge aiming at traditional ant colony algorithm's drawback of long time consumption and easily to be affected by noise. The methods improved parameters from clustering centre setting, clustering operator selecting and pheromone updating, then extracted subpixel image edge based on Zernike moments. Therefore, the result of image edge extraction is good and effective. Lastly, least square fitting is used to locate coordination of image edge and bearing of SKF 32308 J2/Q dimensions such as inner and outer diameters were measured. The result shows that the algorithm proposed can well to measure circular parts dimensions and has high precision.

Keywords: Subpixel, Ant Colony Optimization, Bearing, edge detection

Hong Li Application of PID-type iterative learning control for DC motor

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Iterative learning control is a new control technology, which is a branch of intelligent control theory and particularly suitable for the controlled object with repetitive motion. In this paper, a PID-type iterative learning control for DC

motor based on the characteristics of repeating motion of DC motor was proposed and the convergence of iterative learning control algorithm was analyzed. The input of controlled system in current cycle was amended by the error achieved between the system output and the desired trajectory in previous iteration. It was tested that PID-type ILC had good performance and stability through a large number of simulations and the experiments of the velocity tracking are done by MATLAB software. The results showed that the velocity tracking precision of DC motor was higher and the error was smaller with the increasing number of iterations. The velocity tracking error was close to zero. It was also shown that the motor could fully track the given desired trajectory in some certain iteration. It was also revealed from simulation results that the proposed control strategy was valid and effective for the DC motor.

Keywords: PID control, DC motor, PID-type iterative learning control

Xianliang Yang, Lianlian Jia, Songling Wang, Jiangjiang Wang Based on pressure gradient model to determine leakage point in heating pipe network

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This paper describes a calculation method based on pressure gradient model to determine leakage point in central heating pipe network which decreases the effect of the ratio frictional resistance. In the calculation method, a pipe resistance characteristic coefficient is introduced. This characteristic coefficient is corrected by hybrid adaptive genetic algorithm. With the characteristic coefficient and the pressure value of each node in heating pipe network, the leakage point orientation in central heating pipe network can be done with the positioning analysis on the heating pipe network leak. The pressure value is calculated using the theory of graph algorithms. In this analysis, the pressure gradient is the most important analytical method. According to the data monitored by supervisory control and data acquisition (SCADA) system, the leak position can be located. The experimented results show that the method to locate the leakage point in the thermal system pipe network meets the theoretical need and the experimental one.

Keywords: Heating pipe network, Leakage location, Drag coefficient, Pressure gradient

Jian-Ning Han, Peng Yang, Lu Zhang External locating of moving targets for 3D IMRT using parallax method

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Due to the complexity of intensity modulated radiotherapy, it is difficult to meet the current situation of treatments which require real time locating of moving target. In this paper, we propose a new method based on parallax method using external label to locate the moving target. A column test-piece is used to simulate the human body structure for data analysis. A defect model for human body target is implanted inside the test-piece, which is the moving target. Based on the parallax method, the depth of the defect can be obtained by using the two images captured before and after the test-piece moves a short distance. The possible errors which affect the test results are analysed. The effects of errors can be reduced by adjusting the system parameters. The results show that the parallax method is a simple but efficient approach, which can be used for locating moving target in intensity modulated radiotherapy.

Keywords: Intensity modulated radiotherapy, Moving target location, Parallax method, Three-dimensional location, External Label

Chun Li, Hong Nie, Jinbao Chen Motion analysis and simulation of a 12-Tetrahedral Walker Robot

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A novel robot mechanism-tetrahedral rolling robot is introduced in the paper. The robot comprises of 26 extension struts and 9 nodes. When the COG of tetrahedron exceeds the stability region, the robot will roll. The structure of the 12-TET robot is described. Designing method of the robot is given, and it is proved correct and feasible through simulation. Kinematic models in different motion phases are analysed in the paper, and the rolling critical condition is formulated. The effectiveness of the method is testified through simulation. The study of the paper will provide important reference for the dynamic analysis, optimization design and control of the tetrahedral rolling robot.

Keywords: Variable tetrahedron robot, Gait planning, Motion analysis

W Huang, D Y Liu, H F Jiang, F Y Liu Numerical and analytical solution of stresses on a box-type lining structure under the effect of ground fracture

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This study attempts to study the stress mechanism of a box-type lining structure during its inclined penetration of ground fissure and calculate the normal stress and shearing stress of the structure section. Based on thin-wall structure theory combined with the stress boundary conditions of the physical model of the box-type lining structure, we derived the analytical solution of the normal stress and shearing stress of the physical model. The stress analytical solution indicates that the damage of the footwall of the ground fissure is more serious than that of the hanging wall, which could match the physical model experiment. The effectiveness and accuracy of the analytical solution of the normal stress and shearing stress of the section were verified using finite element software to establish the mechanical model of the box-type lining structure. The results of the numerical model were compared with the analytical solution results.

Keywords: Box-type structure, Lining structure, Ground fissure, Analytical solution

Zhenzhen Jia, Feng Tao Numerical simulation on methane explosion propagation in a one-dimensional straight duct with porous metal materials

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Based on the theoretical and experimental results of methane explosion propagation in porous metal materials, methane explosion propagation in a one-dimensional straight duct with different layers of porous metal materials is simulated by *Fluent* software. The layers and length of porous metal materials have influence on the flame propagation velocity and explosion shockwave overpressure. Only the propagation distance of methane explosion is beyond 5 times the diameter of the duct, the flame and explosion wave can be attenuated by the porous metal materials. Moreover, the more the layers are, the better the attenuation effect is. The numerical simulation results show that, during methane explosion propagation in porous metal materials, the attenuations of explosion wave overpressure and flame propagation velocity takes on synchronization and correspondence. Consequently, the porous metal materials can suppress methane explosion propagation. The process of methane explosion in the duct well reappears with numerical simulation, thus the model is established correctly and the numerical simulation is a good supplementary means of experiment.

Keywords: Methane Explosion, Porous Metal Materials, Flame Propagation Velocity, Explosion Shockwave Overpressure, Fluent Software

Bin Dong, Guojie Yang, Tie Liang Research and realization of handheld radio direction finding communication system

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Radio direction finding communication system has been widely used in civil and military fields. The handheld communication equipment with small development volume and low power has become the irresistible trend. Combined with magnitude comparison, a handheld direction finding and communication receiving system is researched and designed. And it is applied to radio communication system. This system can remove the influence of antenna on the hardware circuit, human body interference and surrounding environment. Besides, it has the advantages of small volume, fast direction finding speed and good capacity of resisting disturbance. Therefore, this handheld radio direction finding communication system has significant application value in public security, forest fire prevention and geological prospecting etc.

Keywords: radio, direction finding, communication, magnitude comparison

Jiong Zhang, Shaofei Chen, Lihua Liu Research on commutation torque ripple suppression strategy of BLDCM based on iterative learning

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Brushless DC motor (BLDCM) is the DC motor which uses electronic commutation instead of mechanical commutation. The torque ripple caused by mechanical structure of the motor is small, while the torque ripple during the commutation is about 50% of the average torque. By analysing the unique features of commutation torque ripple, we can obtain the relationship between the commutation current and torque ripple. The current ripple can be suppressed through adding voltage compensation of the three-phase bridge inverter circuit. Then the commutation

torque ripple suppression strategy based on iterative learning was raised in this paper. With the MATLAB Simulink platform, BLDCM simulation models, which based on the iterative learning are established and simulation contrast experiments of open or closed-loop iterative P-type with or without adding the voltage compensation have been designed to test and verify the effectiveness of the suppression strategy.

Keywords: BLDCM, Iterative learning, Torque Ripple, Voltage compensation

Guoping Shi, Jun Liang The gradual learning static load modelling method based on real-time fault recorder data

Computer Modelling & New Technologies 18(5) 297-302

Setting a real-time load model is an effective way to overcome time-variation of power load in course of power load modelling. On the basis of load data sorting, this paper proposes a gradual learning static load modelling method based on power fault recorder data. Firstly, power fault recorder collects and stores valid load data. Secondly, all valid load data will be classified by the time, static load model can be built corresponds to each classification. Thirdly, model parameters of each sort are identified by gradual learning method, for the goal of global fitting optimal for the measured active power and calculated active power, the load model parameters are optimized by using curve fitting method. The identified model parameters can be applied to power system calculation directly without preserving all load data, essential feature of all load data is reserved and modelling operational efficiency is improved greatly. Simulation results show that the gradual learning method is right and effective, which is easier to realize and is of higher precision compared with least squares method, therefore the method has widely applicable value and is prospective in power system on-line static load modelling.

Keywords: Fault Recorder, Static Load Modelling, Parameter Identify, Gradual Learning, Curve Fitting

Ying Kong, Xiao guang Chu The scroll flow and torque prediction with the wavelet neural network optimized by PSO and BP

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A new Compressed Air Energy Storage(CAES) with scroll was proposed to promote the storage efficiency, which can be acquired by the scroll efficiency tracking control with the timely evaluation, but the flow and torque is not easy acquired because the sensors possessed the merits of high price, lower life-span and subjection to the disturbance, so a torque and flow prediction algorithm based on Wavelet Neural Network (WNN) is proposed adopting a hybrid learning algorithm combining Particle Swarm Optimization (PSO) with BP. Through the comparison between predictive and the experimental data and the scroll efficiency experiment, the proposed prediction method is validated and can be successfully used to improve Pneumatic conversion efficiency.

Keywords: Compressed Air Energy Storage, Scroll, Particle Swarm Optimization (PSO), Wavelet Neural Network

Xiaohui Liu, Xiaoping Zhao, Jianfeng Liu A study on the acoustic emission characteristics of the coal rock on different bedding direction

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The rock mechanics servo system (MTS815) and the acoustic emission testing system (PCI-2) were selected in this paper to conduct the uniaxial compression test and the acoustic emission test from two different direction of the coal and to clarify the acoustic emission feature during the process compression deformation of the coal. The results show that there is an obvious difference on the characteristic parameter of acoustic emission and the spatial distribution during the process of uniaxial compression, which is from different directions. On the initial compression phase, the stress growth rate of the coal from the vertical direction is greater than that from parallel bedding coal and the acoustic parameters. Acoustic emission ringing, energy and event count rate are less than the coal rocks from parallel bedding. The acoustic emission count will increase with arise stress, the coal from the parallel direction is more stable than the coal from the vertical direction; the coal acoustic emission has significantly reduced which from the vertical direction when after the peak stress and there is a little change with the parallel coal rock; The acoustic emission event of the coal which is from the vertical direction and the parallel coal usually concentrates in the lower part of the coal.

Keywords: Coal Rock, Acoustic Emission, Spatial Distribution of Events, Bedding Direction, AE Characteristic Parameters