

Cumulative Index

Mathematical and Computer Modelling

Yurii Kozachenko, Anatolii Pashko Accuracy of Simulations of the Gaussian random processes with continuous spectrum*Computer Modelling & New Technologies 2014 18(3) 7-12*

This paper investigates algorithms for the construction of sub-Gaussian models for the Gaussian stationary random processes with continuous spectrum. Estimates for random processes with analytical correlation functions retrieved and improved existing ones. Algorithms for simulation of random processes with given accuracy and reliability in various function spaces were constructed.

Keywords: Gaussian process, simulation, sub-Gaussian model, model accuracy, model reliability

Shuren Wang, Junqing Su, Paul Hagan Energy dissipation characteristics of sandstone cutting under mechanical impact load*Computer Modelling & New Technologies 2014 18(3) 13-20*

Based on the sandstone experiment by using the linear rock cutting machine at the school of mining engineering, University of New South Wales (UNSW), the computational model was built by using particle flow code (PFC), and the energy dissipation characteristics was studied considering these parameters such as cutting speed, cutting depth, rock strength, rock temperature and rock confining pressure. The results showed that the specific energy and acoustic emission of sandstone were proportional to the cutting speed and rock strength, there was an optimal depth of rock cutting with the cutting depth increasing under the confining pressure condition, and the specific energy and acoustic emission of sandstone changed obviously due to the influence of the rock temperature and rock confining pressure.

Keywords: Rock Cutting, Energy Dissipation, Specific Energy, Acoustic Emission, Particle Flow Code

Zhenzhen Jia, Feng Tao Gas explosion characteristics and its control technologies in closed fire zone*Computer Modelling & New Technologies 2014 18(3) 21-25*

The closure measures of fire zones are taken after gas explosion in the working face, which can bring two problems: whether closure measures will lead to a secondary gas explosion in closed fire zones or not, and what will be the rough time interval between taking measures and gas explosion occurrence. To solve these problems, gas accumulation characteristics, oxygen concentration characteristics and fire sources in the fire closure process were analysed, and then the characteristics and rules of gas explosion were acquired, in addition, the pressure change and gas accumulation model in closure zones under three conditions (the temporary closure wall only in air inlet laneway, only in air return laneway, or both in air inlet laneway and air return laneway) were obtained. Finally, the measures and technologies to prevent and control gas explosion were introduced in the fire closure process of working face.

Keywords: Closed Fire Zone, Gas Explosion Characteristics, Gas Accumulation Model, Fire Sources, Control Technologies

G Wang, H Y Wang, Q M Huang, C Q Su Numerical modelling of rock cross-cut coal uncovering based on ANSYS*Computer Modelling & New Technologies 2014 18(3) 26-32*

Outbursts of coal and gas could be induced by rock cross-cut coal uncovering. ANSYS is used to numerically simulate the stress, strain and energy of surrounding rock of roadway during the process of rock cross-cut coal uncovering. Modelling results show that there is a banding tension stress zone in roof and floor of roadway after excavation. Principal and shear stress concentration are formed in the upper and under area of the anterior heading face, which is symmetrically distributed between medial axis of roadway, while stress, strain and strain energy of overlying strata above the coal seam approximately keep invariant. The occurrence of the stress concentration in upper area of the anterior heading face could contribute to the instability and failure of coal and rock mass. The area with weak destruction-resisting ability is the most easily to be the releasing port of outburst and should be regarded as the key region in outburst prevention.

Keywords: Rock Cross-cut Coal Uncovering, Numerical Modelling, ANSYS, Stress Distribution

Hua Zhang, Xiaoping Jiang, Chenghua Li UKF-based underground intrusion localization algorithm for optical-fibre sensing perimeter protection

Computer Modelling & New Technologies 2014 18(3) 33-38

To improve the precision of the underground intrusion localization in the optical-fibre sensing perimeter protection application, an intrusion localization algorithm based on the Unscented Kalman Filter (UKF) is presented. The geometrical relationships of the sensors and the intruder are analysed and the state equation and the measurement model are deduced. Then the UKF algorithm is used to estimate and track the location of the intruder. The simulations demonstrate that the algorithm improves the intrusion localization precision and the intruder can be tracked even if not enough sensors detect the intrusion signal.

Keywords: Optical-Fibre Sensor, Underground Intrusion Detection, State Estimation, Unscented Kalman Filter

Junxia Zhang, Hongxing Zhao A novel compressed air solar energy photo-thermal generating electricity system

Computer Modelling & New Technologies 2014 18(3) 39-43

On the basis of comparing the solar photovoltaic and photo-thermal generating electricity advantages and disadvantages, to overcome the phase-change losses caused by water evaporated into vapour, a compressed air solar energy photo-thermal generating electricity system was proposed in the present work. Air was compressed with compressor and heated with solar heater so as to get high temperature and pressure. High-temperature and high pressure air passes into turbine to generate electricity. The entire design is simple and compact, safe and reliability, energy saving and environmental protection. Thermodynamic cycle analysis was carried out. It comes to conclusion that practical efficiency depends on pressure ratio, the compressor and turbine efficiencies and solar photo-thermal conversion efficiency.

Keywords: Compressed air, solar energy, photo-thermal, generating electricity

Zhi Hui Wen, Jian Ping Wei, Hong Tu Zhang, Shao Hua Dai An experimental study on coal gas desorption laws with different particle size

Computer Modelling & New Technologies 2014 18(3) 44-48

Based on the self-designed coal containing methane gas desorption law experimental system and coal gas desorption kinetics law, the gas desorption law for different particle size coal under isothermal-isobaric condition are measured by combining combined simulation measurement with the theoretical analysis. The effect of particle size on coal gas desorption laws are obtained through fitting analysis on experimental data: 1. Under the same sorption and desorption conditions, coal particle size was inversely related to total desorption gas amount in the same period. 2. For coal with any particle size, the gas desorption amount firstly increased as time, and finally reached the maximum value, which was equal to the gas sorption amount unit per mass. 3. For coal with higher gas and coal outburst risk trend, the effect of particle size on initial desorption velocity and total desorption amount with time was less. 4. Within the limit particle size, the gas initial desorption velocity had a negative relationship with particle size. Finally we theoretically analysed the effect of particle size on coal gas desorption laws.

Keywords: Particle size, Gas desorption, Gas adsorption, Pore

Zhigang Yin, Guohui Gao Application of fractal theory to dam deformation forecast

Computer Modelling & New Technologies 2014 18(3) 49-51

Based on the safety observation data of dam, the establishment of the prediction model of dam deformation is very important for safe operation of the reservoir. The early deformation curve of the dam has self-similar fractal feature. The fractal interpolation function can be applied to not only processing the dam prototype observation data but also forecasting the rule of early dam deformation. In this paper, the reservoir dam deformation can be analysed and predicted by the fractal interpolation function. Analysis shows that, the method for dam deformation prediction of maximum error is 8.0%. Therefore, regarding the half-year short-term forecast, the forecast result obtained from fractal interpolation function method could be reliable.

Keywords: dam, the fractal interpolation function, forecast

Yinglin Li, Lianhe Yang, Suying Chen, Lei Xu Three dimensional simulation of weft knitted fabric based on surface model

Computer Modeling & New Technologies 2014 18(3) 52-57

In order to enhance the visual simulation effect of weft knitted fabric in weft knitting CAD system, a three dimensional surface model of weft knitted structures is developed and realized on the computer screen. It is assumed that the yarn centreline is continuous when it is stressed to bend, and the cross-section of yarn is circular and uniform. Three dimensional geometric models are created by using second order continuous NURBS curves. According to the trend of the yarn centreline, a surface model of the yarn is created by sweeping approach. With developing tools of Visual C++ and OpenGL graphics library, the surface model of loop is achieved by the method of mesh chips on computer screen, and the three dimensional simulation of weft knitted fabric is realized. The simulation effect based on surface model can be seen from the simulation results of basic weft knitted fabric.

Keywords: Weft knitting, Loop structure, NURBS; Simulation, Surface model

Chang Zhi Zhu, Quan Chen Gao Three-dimensional computer simulation of soil nailing support in deep foundation pit

Computer Modelling & New Technologies 2014 18(3) 58-62

The computer application program that is applied based on the finite difference method. By taking the soil nailing support structure in Shijiazhuang city as an example, the three-dimensional computer numerical model of deep foundation pit is set up; the horizontal displacement and the ground settlement of the deep foundation pit are simulated in the process of excavation and support. The simulation result is consistent with the test result. The results show that the deformation behaviour of the deep foundation pit can be analysed by using three-dimensional computer simulation technology in actual project. The method overcomes the deficiency of theoretical analysis method and offers effective guidance for design and construction of foundation pit excavation and support.

Keywords: Three-dimensional computer simulation, Soil nailing support, Deep foundation pit

Bing Bai, Xiuquan Deng, Zhiqiong Guo, Dehua Gao Organizations learning mechanism in the cyber society ecology system: an agent-based simulation

Computer Modelling & New Technologies 2014 18(3) 63-67

In this paper, we try to focus on the cyber society ecology system, which is a naturally occurring complex system to a certain stage of networks economic development. Based on the multi-agent simulation methodology, this paper analyses adaptive learning among organizations of cyber society ecology system, and then designs interaction rules of agents and simulation parameters, and finally the simulation results are analysed.

Keywords: Cyber Society Ecology System, Adaptive Learning, Agent-Based Simulation

Xing-bin Ma, Cui-pin Jiang The approach of fixed asset management based on the shortest path

Computer Modelling & New Technologies 2014 18(3) 68-71

We often meet with shortest path problem in National Undergraduate Mathematical Contest and practical life. The definition of shortest path problem is introduced, Dijkstra algorithm and 0-1 Programming Method to solve the shortest path problem are given. A practical problem is given and is calculated by these two methods.

Keywords: mathematical modelling, shortest path problem, Dijkstra algorithm, 0-1 Programming

Xuhong Guo, Xing Huang, Shaohua Wu Correlation between austempering parameters and hardness of austempered ductile iron based on artificial neural network

Computer Modelling & New Technologies 2014 18(3) 72-76

Mechanical properties of ADI mainly depend on the austempering parameters, which include austenitizing temperature and time, austempering time and temperature, apart from chemical composition, alloyed elements and casting parameters. In this paper, an investigation has been conducted on the prediction model of mechanical properties of ADI between austenitizing temperature and time, austempering temperature and time as inputs and Vickers hardness of samples after austempering as the outputs based on artificial neural network. There are two types of data of the model: training data and testing data. The former data come from the published literature and 12 experimental data used for network testing. The research results of the model shows that the predicted values approach to the measured data in most of the testing samples and the maximum margin of error between experimental and predicted data is 4.682%.

Keywords: Austempered Ductile Iron, Artificial Neural Network, Austempering Parameters, Mechanical Properties, Prediction

Model

Chih-Feng Chao, Ming-Huwi Horng Firefly algorithm for training the radial basis function network in ultrasonic supraspinatus image classification*Computer Modelling & New Technologies 2014 18(3) 77-83*

The physicians observed the echo-texture and the shape changes of supraspinatus to decide the severity of rotator cuff disease in the clinical standard ultrasound examination. It is not reliable because the accuracy of visual observation depends on the experience of physicians. This article proposes a new algorithm called **Firefly RBF** network to training the radial basis function neural network by applying the firefly algorithm for classifying the different supraspinatus disease groups that are normal, tendon inflammation, calcific tendonitis and tendon tears of the ultrasound supraspinatus images based on the texture analysis technology. The texture features are generated from four methods those are the grey-level co-occurrence matrix, the texture spectrum, the fractal dimension and the texture feature coding method to analyse the tissue characteristic of supraspinatus. The F-score measurement are used to select powerful features those are generated from the four texture analysis methods for comparison in the training stage, meanwhile, the proposed Firefly RBF network is used to discriminate test images into one of the four disease groups in the classification stage. Experimental results showed that the percentage of correct classification was more than 93.7% that is superior to other methods in the classification of ultrasonic supraspinatus images.

Keywords: Radial basis function network, Firefly algorithm, Ultrasonic supraspinatus image, Texture analysis

Shiqing Yang, Lanfang Miao Material simulation based on Phong illumination model*Computer Modelling & New Technologies 2014 18(3) 84-87*

Realistic material simulation is one of the major works in rendering realistic graphics. In this paper, we have studied and discussed the effects of rendering realistic graphics by simulating some materials under different illumination conditions and material attributes and emission based on the OpenGL graphics technology and Phong illumination model. Experimental results show effects of emission on specular and non-specular materials and demonstrate the emission effects to some degree.

Keywords: Phong illumination model, Realistic graphics, Material simulation, Emission

Li Jun Tan, Bo Fang, Ming Ming Li, Ye Tang, Wen Hu Huang Parametric identification for GHM and application of viscoelastic damper*Computer Modelling & New Technologies 2014 18(3) 88-92*

The GHM (Golla-Hughes-McTavish) model is extensively utilized by structural designers for studying complex structures with viscoelastic damping treatments in engineering. A kind of shear-type viscoelastic damper is investigated, and the damper is modelled with GHM model. The parameters of GHM model are identified by curve fitting and a detailed experiment in complex frequency domain. The comparison results show that the method proposed in the present paper to determine the parameters of GHM model is correct. A whole-spacecraft vibration isolation experiment is practically performed, and the results show that using the method to design the WSVI (Whole-spacecraft Vibration Isolator) is effective for isolating structure vibrations.

Keywords: viscoelastic damper, GHM model, vibration experiment, WSVI

Longmiao Chen, Qiang Fu, Gui Lin Study on the sealing properties of the sealing structure for the rotating chamber of a certain cased telescoped ammunition gun*Computer Modelling & New Technologies 2014 18(3) 93-97*

To solve the spherical transient high pressure gas seal problem for the rotating chamber of a certain medium calibre cased telescoped ammunition gun, a self-impacted combined sealing system was newly designed which can be placed at semi combustible cartridge of the cased telescoped ammunition. The sealing mechanism of the structure was analysed and simulation studies on the comprehensive properties of the sealing structure were carried out via the FEM dynamic response. In addition, the simulation and verification tests were conducted to test the sealing performance of the sealing structure. The results of the simulation analysis and the experiments demonstrate that the designed sealing structure has a good sealing performance and can solve the spherical transient high pressure gas seal problem for the rotating chamber of the medium calibre cased telescoped ammunition gun, and it is expected to offer a reference value to solve related problems in engineering.

Keywords: Sealing for the Rotating Chamber, FEM, Test Verification, Cased Telescoped Ammunition

Information and Computer Technologies

Xin Pan, Hongbin Sun A self-adaptive selective method of remote sensing image classification algorithms
Computer Modelling & New Technologies 2014 18(3) 98-103

Remote sensing image classification algorithms, which can obtain information of land use\cover quickly and inexpensively have been widely used in the field of GIS. The quality of classification results is not only affected by the quality of remote sensing data, but also affected by the character of classification algorithm. At present, despite a lot of algorithms have been proposed, but users usually meet difficulties in algorithm selection due to single classification algorithm cat not applicable to all classification cases. This study proposes a self-adaptive selective method for remote sensing image classification algorithms based on data complexity evaluation, through data complexity evaluation, our method can distinguish remote sensing data's character even from same satellite sensor and give user recommendation of algorithm selection. Experiments indicate that the algorithms selected by this method can achieve higher classification accuracy, which provides the recommendation for the selection of appropriate classification models to users.

Keywords: Remote Sensing image, Classification, Algorithms Evaluate, Data Complexity

Hong Jiang, Wenlei Sun, Yongfang Shi, Yanhua Huang A study and implementation on the data reduction based on the curvature of point clouds
Computer Modelling & New Technologies 2014 18(3) 104-110

Computer Modelling & New Technologies 2014 18(3) 104-110

In the process of Reverse Engineering (RE), higher density of measured data from all kinds of parts with complex curved surface will not only lead to lower efficiency in computing, storing and data processing, but also affect the fairness of reconstructed surface. According to the advantages and disadvantages of common algorithms, an algorithm for data reduction is proposed in this paper, in which the neighbourhood search method based on the point cloud's curvature is used. With the utilization of proposed algorithm, high precision and the desired effect can be ensured. Finally, a roller bit's data cloud, as an example, is reduced efficiently and validly by the algorithm in this paper.

Keywords: Reverse Engineering, Data Reduction, Point Cloud, Curvature

Xin Zhang Multi-objective improved algorithm for flow allocations in hazardous chemicals logistics preference paths
Computer Modelling & New Technologies 2014 18(3) 111-114

Computer Modelling & New Technologies 2014 18(3) 111-114

The flow allocation of paths was a key stage of the transportation network's efficiency, particularly in the hazardous chemicals logistics network where many weights were stochastic. Over the years, a variety of methods (or heuristics) have been proposed to solve this complex optimization problem, with good results in some cases just with limitations in the special fields. In this work, we develop an algorithm for model multi-objective that combines ideas from stochastic weight. Our method performs well even when the order of magnitude and/or the range of the parameters were unknown. The method refines iteratively a sequence of parameter distributions through preference combined with partial exempling from a historical prior defined over the support of all previous iterations. We exemplify our method with multi-objective improved models using both simulated and real experimental data and estimate the weight efficiently even in the absence of a priori knowledge about the weight.

Keywords: Hazardous chemicals transportation, Flow allocation, Multi-objective optimization, Path preference, Control

Wei Wang, Xiao-dan Huang Spatially aware in implicit human robot interaction
Computer Modelling & New Technologies 2014 18(3) 115-123

Computer Modelling & New Technologies 2014 18(3) 115-123

Implicit interaction pattern between the human user and the robot is important for reducing cognitive burden and enhancing cooperation effect. Given that the spatially aware is a foundation for human-robot cooperation, for the existing researches of robots, in this paper, a reachable space for a serial robot arm with a fixed monocular vision system and five degrees of freedom (5-DoF) was built. Based on the link frame with D-H notation, analysis and simulating experiments were carried on to show the reachable space in three dimensions. In addition, multi ultrasonic sensors are used to detect the space realizing proximity controlled.

Keywords: Human Robot Cooperation, Spatially Aware, Reachable Space, Proximity Controlled, Implicit Pattern

Hongqing Hou, Qian Miao, Chuanqiang Yu, Qinhe Gao Study on T-S fuzzy sliding mode control based on a new reaching law

Computer Modelling & New Technologies 2014 18(3) 124-132

Fuzzy Sliding Mode controller based on fuzzy T-S Model is designed for the nonlinear, uncertainties and fast variable time characterizes question of bank-to-turn aircraft control and guidance system model. BTT control model was obtained by using T-S modelling method, asymptotically stable sliding surface was designed, and a new sliding mode reaching law is proposed. Based on the new reaching law, sliding mode stable tracking controller is designed. At last, the rationality and the effectiveness of the designed T-S fuzzy sliding mode stable tracking controller with the new reaching law are verified by the theoretical proof and the simulation experiments.

Keywords: Bank-to-turn Aircraft, Fuzzy Control, Sliding Mode Control, Reaching Law

Lei Zhao, Guangxue Chen A printer reverse characterization model based on BP neural network

Computer Modelling & New Technologies 2014 18(3) 133-143

For colour printer, there are very complicated nonlinear relation between its printed colour chromatic values and input digital image pixel values. In the research, data sets of printed colour chromatic values and their digital image pixel values are classified by hue angle range, the data in each hue angle range is taken as learning samples to create BP neural network. With improved combined method of additional momentum factor and variable learning rate, BP neural network of each hue angle range is trained and created. The experiment result shows that, with appropriate structure and classified learning samples, the reverse characterization model based on ten BP neural networks can be trained in relative short time; the colour errors between the experimental printed colour chromatic values and computed printed chromatic values are far less than the threshold of human eyes, i.e. the reverse characterization model achieves rather high accuracy.

Keywords: BP neural network, Hue angle range, Data classification, Colour management

LiLi Chu, LiLi Qin Communication technology in the application of the smart grid

Computer Modelling & New Technologies 2014 18(3) 144-150

By studying the significance of the smart grid, combined with a regional substation point location, line conditions, existing and future business development, existing communications equipment status, etc., the author initially sets the smart grid communications infrastructure deployment and network planning, in order to use the most reasonable communication technologies to support rapid development of smart grid. In a certain city with electric power communication network to the actual construction goal, we should complete the city power system communication network covering the whole deployment. At the same time combined with network energy efficiency project, we should analyse the already formed network, provide effective optimization model of energy efficiency and practical algorithm, and analyse its rationality through the simulation analysis, further improve the overall network in order to make it efficient to run.

Keywords: Smart grid, Data network, Network energy efficiency, Energy efficient routing strategy

Ling Zhou, De Feng Zhang A distributed multicast routing algorithm based on bone node set for mobile IP

Computer Modelling & New Technologies 2014 18(3) 151-158

Multicast routing is an important issue in network communication. In order to optimize the multicast routing cost and lessen the transmission delay for mobile IP communication, an idea of bone node set is introduced and the distributed multicast routing algorithm is designed based on the idea firstly. At the same time, the algorithm is implemented according to centre version and distributed version in detail, respectively. Then its necessary data structures, time complexity and message complexity are analysed in theories according to order of sequence for distributed operation. At last, simulation experiments are done in a 7×7 mesh topology and the results show that the designed algorithm can optimize the routing cost for multicast routing and reduce the transmission delay greatly compared to some same type algorithms. The distributed routing algorithm with the simple complexity can be efficiently used in large-scale mobile IP network.

Keywords: Distributed routing, mobile IP, bone node set, performance analysis, simulation

Bing Xu The study of campus network traffic monitoring platform

Computer Modelling & New Technologies 2014 18(3) 159-163

From the view of practical campus network traffic monitoring platform, one kind of solution based on the model of SNMP and NETFLOW network management frame was put forward to elaborate the designed overall structure of campus network traffic monitoring platform, data acquisition, traffic plotting and so on. Using Visual C++6 to design this platform, not only the key technology and methods for realizing the campus network traffic monitoring platform could be achieved, but also the network traffic monitoring and management should be completed. The implementation of this platform can efficiently monitor the network traffic.

Keywords: Campus traffic, Network traffic, Traffic monitoring, management platform, VC++6

Fu Zhang, Yakun Zhang, Binbin Yue, Guoying Zhang The gait analysis on the sloping walking of goat

Computer Modelling & New Technologies 2014 18(3) 164-169

The 18° sloping walking state and movement rules of the goat was researched by the high-speed video camera system. The movement process and the imaging results of goat in 18° sloping fields were recorded in the computer. The experiment imaging results of goat movement process were analysed by SigmaScan software and Matlab software, the results showed that gait parameters and angle change curve of each leg on 18° slope was obtained. The research will provide the basis of the experimental data for bionic design of agricultural machinery of goats sloping walking mechanism.

Keywords: Goat, High-speed camera, Sloping fields, Gait

Shang Zhang, Tingyan Xing RSSI Enhanced indoor LBS platform design

Computer Modelling & New Technologies 2014 18(3) 170-173

The fast development of WSN (Wireless Sensor Network) provide the solution to indoor localization application. To which, the position accuracy become the essential problem need to solve. This paper introduces in detail the composition of the whole system and the design of localization algorithm based on RSSI. Through computing the relevance of adjacent nodes of target tag, the enhanced localization method is introduced and reasonable system design prove the possibility to build a high accuracy indoor localization system based on WSN.

Keywords: WSN, RSSI, indoor localization, LBS

Zhaohua Liu, Yuxia Yang Study on semi-global matching algorithm extended for multi baseline matching and parallel processing method based on GPU

Computer Modelling & New Technologies 2014 18(3) 174-178

This paper extended semi-global matching algorithm into multi baseline matching to improve matching reliability, especially studies kernel function optimization strategies and GPU threads' executing scheme of matching cost cube computing and aggregating, and realized its fine granularity parallel processing based on GPU. The experiment results using three UCD aerial images based on Tesla C2050 GPU showed that MVLL's semi-global optimize algorithm can improve matching effectiveness and productiveness.

Keywords: semi-global matching, multi baseline matching, dynamic programming algorithm, GPU, parallel processing

Rui-Lin Lin Industrial product innovative design of toilet sensor timer

Computer Modelling & New Technologies 2014 18(3) 179-182

This study came up with an innovative product design for toilet safety timer, which can be installed in public lavatories or toilets at home. When an elderly person is in a toilet for a period of time longer than the time set in the device, a warning will be sent to the outside. The unique feature is the safety device of the sensor timer with the innovative structure containing an infrared sensor, a CPU, a timer, and a warning device. Users can set up the time on the timer. In case of an emergency such as users falling by accident or being in a coma, a warning will be sent out in time to get help to prevent tragedy from happening.

Keywords: Toilet Safety, Timer, Industrial Product

Hongkai Li, Zhendong Dai Mechanism design and flow estimation method of a hydraulic actuated robot

Computer Modelling & New Technologies 2014 18(3) 183-187

With the extension of robot applications, robot with high adaptability and high load capacity become a new focus in the recent years. Wheeled robots have the advantages of high load and speed, but this is limited in specified substrate. Legged robots inspired by the legged animals could move on rough terrain, so it was selected as a robot prototype for

the high adaptability and high load capacity robot. In this paper, the structure of a hydraulic actuated quadruped robot was proposed. And then the kinematics of single leg was analysed. To estimate the required flow, a trot gait with 50% duty cycle is schemed and the trajectories of feet were planned. Then the total flow of the system required was calculated with the planned motion. The result can be taken as a reference to optimize the robot mechanism and select the hydraulic system.

Keywords: hydraulic actuated, quadruped robot, mechanism design, flow estimation

Maoyi Tian, Rufei Liu, Xiushan Lu Ground point filtering method of vehicle-borne laser point cloud in urban street

Computer Modelling & New Technologies 2014 18(3) 188-192

Through the analysis of the spatial characteristics of vehicle-borne laser point cloud data in urban street, a method to extract ground points accurately from point cloud data is proposed. Firstly, three-dimensional virtual grid is used to organize point cloud. Secondly, the initial low ground point in a grid is extracted by level plane constraint (LPC) method, and then a multi-scale neighbourhood analysis (MSNA) method is taken to optimize the low ground points further. Finally, the ground points from original point cloud data are filtered based on the local slope. The experiment shows that this method can effectively extract the ground points.

Keywords: Vehicle-borne Laser, Urban Street, Ground Point Filtering, MSNA

Beibut Amirgaliyev, Magzhan Kairanbay, Chingiz Kenshimov, Didar Yedilkhan Development of automatic number plate recognition system

Computer Modelling & New Technologies 2014 18(3) 193-197

Today, the automatic number plate recognition (ANPR) system is a key aspect in traffic congestion. This will help minimizing the different kind of violations in the road. Advanced systems for tracking and fixing stolen, unauthorized vehicles are based on automated number plate recognition. This paper's main objectives is to review other methods and develop, at the same token evaluate our proposed approach. A very short review is performed on the various methods of number plate recognition systems. Further explanations of the proposed algorithm is illustrated in graphical forms to show how algorithm works. The paper is going to be concluded with test and evaluation results.

Keywords: ANPR, Plate area, Segmentation, OCR

Song Fei, Cui Zhe Study on HDFS improvement scheme based on the GE code and dynamic replication strategy

Computer Modelling & New Technologies 2014 18(3) 198-203

There is a lot of valuable information in the massive amounts of data. Any loss of data may result in a great loss. Data security cannot be ignored. There are varieties of data disaster recovery technologies. However, most of these techniques depend on the hardware devices or data redundancy greatly. This paper presents a distributed data disaster recovery technology that minimum dependence on data redundancy and hardware system redundancy. In addition, this technology has nothing to do with the user equipment and application data structures. The test proved that this new data disaster recovery method can not only enhance disaster recovery capabilities and reduce the redundancy of the system greatly, but also suitable for large-scale distributed data disaster recovery.

Keywords: data disaster tolerance, HDFS, GE code, dynamic replication

Zheng Wang, Zhenjiang Miao Design a media art installation based on fuzzy controlling system

Computer Modelling & New Technologies 2014 18(3) 204-208

As an art installation showed at Houtan station of Shanghai Metro Line7 and 2010 Shanghai World Expo Museum, "smart suspension ball" system displayed the rational sense of form and order of the controlling. The article focused on how to use appropriate fuzzy strategy to make the movements of the art installation more accurate under detailed experimental data. Another point of the article is to consider how to make this art installation to be a product with network, being combined and modular after upgrading the hardware and software of the installation. The performance of this upgraded product will bring more beautiful visual effects of controlling and technique. It will also be a successful case of integrating of science and technology into product designing for development of creative industries in China.

Keywords: Digital Media Art, Fuzzy Controlling, Installation Design, Arduino

Operation research and decision making

Shilong Li, Hongyan Tian Decision-making model of the urban regeneration construction project based on environment improvement

Computer Modelling & New Technologies 2014 18(3) 209-214

Urban regeneration is regarded as a more deliberate and harmonious progress of development, which takes a series of more sensible and multiple regeneration ways to achieve the goals, such as protection, repair, reuse and redevelopment. It is suggested that urban regeneration has positive effects on urban development and social economic system. Improvements in urban systems mainly originate from the environmental improvement, including ecological environment, social environment and the neighbourhood environment. Urban regeneration construction project and its decision-making model become the important research contents of urban regeneration. This paper discusses the urban regeneration from angle of project, and suggests a mathematical decision-making model of the urban regeneration construction project, which considers the risk, cost and environment constraints. Meanwhile, it is suggested that the joint exploitation is an important selection criterion. A case simulation is suggested in this paper in order to test the strategy model.

Keywords: Urban Regeneration, Decision-making Model, Project

Q X Zhang, Y P Wu, G Zh Ou, X G Fan, J H Zhou Displacement prediction of liangshuijing landslide based on time series additive model

Computer Modelling & New Technologies 2014 18(3) 215-223

The evolution of landslide displacement is affected by many factors. This paper studied the displacement monitoring data of Liangshuijing Landslide with Factor Analysis Method and found that the dominant factors influencing landslide displacement were in decreasing sequence: cumulative rainfall of anterior two months > rainfall of current month > the average reservoir level of current month > reservoir level fluctuation of current month. The paper selected three typical GPS monitoring points (ZJC09, ZJC11, ZJC13) of Liangshuijing Landslide to forecast their displacements by adopting the time series additive model on basis of the conclusion of previous factor analysis. The accumulative displacement of Liangshuijing Landslide can be divided into trend term and random term. The polynomial fitting was used for trend term displacement prediction. BP neural network model was used for the random displacement prediction. The final calculation results indicated that combination of factor analysis method and time series additive model could generate a reasonable and accurate prediction of landslide.

Keywords: Displacement prediction, Time series, Liangshuijing Landslide, Factor analysis, BP neural network

Liu Wanli Study on the decision value of analysts' recommendations

Computer Modelling & New Technologies 2014 18(3) 224-230

This paper documents a relationship between analysts' recommendations and the stock price reaction in China. Using a new methodology that combines the event of stock dividends and transfer of reserves to common shares, the author provides evidence of the decision value of analysts' recommendations that is different from the mature market. The results show that analysts' cumulative rating values positively relate to the cumulative abnormal returns. Favourable ratings result in the lower cumulative abnormal returns. The cumulative number of analyst rating agencies negatively relates to the cumulative abnormal returns. In general, analysts' information does not bring abnormal returns for investors.

Keywords: Analysts' Recommendations, Rating, Stock Dividends and Transfer of Reserves to Common Shares

Bao Xing A dual capacity sourcing model of disruption management for an injured power system

Computer Modelling & New Technologies 2014 18(3) 231-236

Great loss would be caused when power system lost its critical capacity by the impact of extreme events. Disruption management of State Grid Zhejiang Electric Power Company of China (shorted for SGZEPC) suffered in 2008 was firstly investigated, and then a dual sourcing model of regular and expedite capacity during recovery periods is correspondingly presented in this paper. A mathematical model of capacity procurement in a multi recover periods is constructed at the aim of minimizing the disruption cost of injured power system. Three meaningful managerial insights are obtained through sensitivity analysis on key parameters, which is helpful for manager to make decision during the disruption period.

Keywords: disruption management, injured power system, dual capacity sourcing, multi-period

Jianxin Bi, Lianghai Lei Analysis on the dynamic effects of the aggregate supply, aggregate demand and macroeconomic policies of China based on SVAR model

Computer Modelling & New Technologies 2014 18(3) 237-248

After studying the financial crisis using the AS-AD model and the SVAR model, the paper analyses the dynamic effects of the aggregate supply, aggregate demand and macroeconomic policies of China. Then, combining the real macroeconomic environment of China at present, the paper discusses the Keynesian AD-AS model, gives the constraint conditions of SVAR model according to the economic meaning of China, makes an empirical study based on five selected variables including supply, demand, fiscal expenditure, monetary expenditure and interest rate and their monthly data correspondingly, and lastly analyses the results of empirical study to make recommendations on current macroeconomic policy adjustment of China.

Keywords: AD-AS model, SVAR model, impulse response, variance analysis

Qiong Gu, Wu Zheng, Xianming Wang Study on Xiangyang's population and aging trend prediction based on discrete population development equation model

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Population problem is an important factor that influences economy and social development of China. This paper takes the statistic data of 6th census in 2010 in Xiangyang as the accordance to establish a discrete model of population development equation, to analyse the population aging trend in the future in Xiangyang from a short period, and further to predict the long-term population development trend and aging population change condition in Xiangyang in the case of different total fertility rate to provide reference accordance for the government to make relevant social and economic decisions.

Keywords: population aging, population development equation, discrete model, total fertility rate

Dong-ping Li, Kong Xiangsheng A Study on Fast Assessment of Medium and Small Earthquake

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The key to rapid assessment of earthquake losses is to identify the seismic intensify area. The information about the scale of earthquake may help the government and the relative department to make countermeasures, dispose disaster rescue action and strive for foreign aid. In this paper, the data of history earthquakes of Zhejiang Province and its surrounding areas, after being processed by GIS system, are used to access the length of the earthquake axis parameters. Then the data are compared with the tectonic structure of the area to determine the classification. After that, the rapid assessment of earthquake model is applying to the axis parameters of earthquakes, which have impact in Zhejiang Province. The model can provide references of earthquake rapid assessment.

Keywords: Fast Earthquake Loss Assessment, GIS, Earthquake disaster emergency

Wan He Deep neural network based load forecast

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Accurate electrical load forecast has great economic and social value. In this paper, we study deep neural networks based load forecast approaches. We first analyse the critical features related to load forecast. Then we present details of deep neural networks and pre-training technologies, including RBM pre-training and discriminative pre-training. We compare the performances of different neural network models and show the advantages of the proposed methods using a rather large data set of loads.

Keywords: Load Forecast, Deep Neural Networks, Pre-training, RBM

Junxiang Tu Retrieving product information of collaborative enterprises based on Bayesian network

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There exist many differences in nomenclature and descriptions of products and parts in collaborative enterprises, which greatly hinder the retrieval and sharing of web-based product information. In this paper, we present an extended Bayesian network for retrieving and integrating the product information of collaborative enterprises based on product ontology. This approach not only reduces the complexity of existing ontology mapping methods, but also increases the efficiency of product information integration.

Keywords: Product Information Retrieval, Bayesian Network, Ontology, Collaborative Enterprises

Li Wu, Xinyuan Wang Geoinformatics-based study on the regionalization of ecological function in the Chaohu Lake Basin, East China

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Ecological function regionalization is a kind of geographic spatial division, which is based on the spatial differentiation of ecosystem functions. Based on an analysis of the primary features of the ecological environment of Chaohu Lake Basin in Anhui Province, the principles, bases, methodology and nomenclature of ecological function regionalization were determined. As the sub-valley is an independent geographical unit within the lake basin, its ecosystem sustains ecological integrity from the upstream through to the downstream. Therefore, ensuring the monitoring and management of the regional ecological environment in the sub-valley unit is of great importance to the conservation and ecological restoration of the regional ecosystem. Through extraction of land use information from remote sensing data, and sub-valley division from DEM analysis, this paper discusses the methodology of sub-valley ecological function regionalization in the research area based on the application of geoinformatics technology (e.g. RS and GIS technology). The ecological function regionalization of the Chaohu Lake Basin is then calculated, and the five ecological function regions and twelve sub-regions are subdivided. This study has an important practical relevance for the integrated management of the ecological environment of the Chaohu Lake Basin, and provides scientific grounds for the improved industrial distribution, ecological hazard prevention and reduction, environmental protection and construction planning in this area.

Keywords: RS and GIS, ecological function regionalization, ecological environment, Chaohu Lake Basin

Yue Wei Ai, Yan He, Zhi Jian Wang, Yang Wang A new method of digital manufacturing of orthoses

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The proportion of disabled people is rising and now represents 1 billion people—15% of the global population, which leads to increasingly demand for orthotic device. However, moulds for orthoses manufacturing through traditionally manual technique are often dedicated, and this causes problems such as long lead time, lack of flexibility, low-efficiency and material waste, further leading to serious financial burns and environmental pollution as well. In this paper, an innovative method is proposed to replace traditionally dedicated moulds with reconfigurable moulds utilizing screw-pins that are directly transferred to the vacuum forming of thermoplastic material at low cost for the fabrication of orthoses. In the developed system, the fast reconstruction of human body anatomy based on the 3D digital scanning, is introduced firstly, the reconfigurable mould utilizing screw-pins is then generated and machined based on the reconstructed human body anatomy. After this, vacuum forming is performed on the reconfigurable mould, which could be reused for different anatomical shape variations by adjusting screw-pins. Additionally, an intelligent database is developed and a lot of reconstructed anatomies, the best practices of experienced orthotists, optimal parameters for 3D digital scanning, reconfigurable mould generation and machining and vacuum forming are stored, which will allow rapid recall of the stored information to reduce too much man-machine interaction and expertise dramatically.

Keywords: Orthoses, Digital manufacturing, Reconfigurable moulds, Fast reconstruction

Wei Sun, Yang Yu Evolutionary game and simulation of organizational information security investment

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To investigate the evolution law of organizational information security investment, this paper analyses evolutionary stable strategies of organizational information security investments using evolutionary game theory and verifies the evolutionary stable strategies through the simulation based on Repast, a multi-agent simulation platform. First, according to the bounded rationality of actual organizations, this paper sets up the evolutionary game model of organizational information security investment. And then, we investigate the evolutionary stable strategies by replicator dynamics. Finally, we simulate the evolutionary game by Repast based on Java programming language, and the experimental results verify the evolutionary stable strategies obtained from the theoretical analysis. The research results can be used to predict the long-term stable trend of organizational information security investment, state that investment cost is the key for organizations to choose the strategy, and provide decision support for organizational information security investment.

Keywords: evolutionary game, information security investment, multi-agent simulation, evolutionary stable strategy

Innovative Education

Laiquan Liu, Li Lei, Yanrui Lei The application of fuzzy association rules in the employment data mining of a higher vocational college

Computer Modelling & New Technologies 2014 18(3) 283-287

Data mining is able to extract potentially useful information from plentiful seemingly unrelated data. A high efficiency is therefore obtained using these useful data in work or study. Association rules mining is a significant branch in data mining. It mirrors the implicit relations among transactions in mass data. In addition, association rules can intuitively reflect the associations among item sets in data, and the relations are established according to the frequencies of the item sets appearing in data. This method, which explains its rules clearly and is easily to understand, therefore is different from the traditional statistical method. This research introduced and applied the mining algorithms of fuzzy association rules to the employment data analysis of a higher vocational college, in order to find significant association rules from numerous data and provide guidance for the education and employment in the future, therefore improving the employment rate further.

Keywords: Association rules, Data mining, Research, Application

Jia Geng Information technology-based promotion of educational resource sharing

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Information technology (IT) has revolutionary influence on the distribution of educational resources, and it plays a role in promoting the sharing of educational resources. Based on absorbing and inheriting the results of previous studies, this dissertation proposed to collect funds to construct large-scale digital education information resource database with centring on counties without building resource centre at basic education schools at all levels. In addition, the schools shall jointly expand and enrich the central educational resources to achieve sharing and co-construction of educational resources in the region. This dissertation also constructed a model of promoting sharing of educational resources by information technology in urban and rural areas.

Keywords: Information Technology, Educational Resource, Sharing

Nanoscience and Nanotechnology

Xia Ma, Mian Mian Zhang, Shi Wen Chen Optimized preparation of γ -polyglutamic acid/chitosan nanocapsule

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This paper described the preparation of novel biodegradable nanocapsule based on self-assembly of γ -Polyglutamic acid (γ -PGA) and chitosan (CS). After the Plackett-Burman design (PBD), the impact of mass concentration and volume of γ -PGA and pH value of CS were characterized by size and PDI of the nanocapsule. A Box-Behnken design (BBD) was used to optimize the preparation of the nanocapsule. The optimized condition was: pH value of CS was 4.0; volume of γ -PGA was 18mL; mass concentration of γ -PGA was 0.1g/L. The Z-Ave and PDI of the nanocapsules prepared under the best conditions were 175 nm and 0.15 respectively. In this work, we have shown that nano-sized particles have been successfully assembled from the γ -PGA and chitosan without employing covalent linkages between these biopolymers. These results will provide a novel concept in the design of carrier systems composed of polyion complex (PIC).

Keywords: γ -Polyglutamic acid, chitosan, nanocapsule, optimization, response surface methodology