BOOK OF ABSTRACT

undertaken if we are to understand these systems in sufficient detail. One set of tools that may prove useful are the formal principles of model building and checking, which could allow the biologist to frame these inherently temporal questions in a sufficiently rigorous framework. In response to these challenges, GOALIE (Gene Ontology Algorithmic Logic and Information Extractor) was developed and has been successfully employed in the analysis of high throughput biological data (e.g. time-course gene-expression microarray data and neural spike train recordings). The method has applications to a wide variety of temporal data, indeed any data for which there exist ontological descriptions. This paper describes the algorithms behind GOALIE and its use in the study of the Intraerythrocytic Developmental Cycle (IDC) of Plasmodium Falciparum, the parasite responsible for a deadly form of chloroquine resistant malaria.

SuA1-5 **9:50-10:10**

Comparability of gene expression in cells of human blood, immune and carcinoma

Xinan Yang, Jianming Xie, Zuhong Lu, and Xiao Sun
Southeast University, China

The tissue-specific pattern of gene expression can indicate important clues for clinical diagnosis and prognosis. Though high-density microarray technology offers the opportunity to examine patterns of mRNA expression on a genome scale, accessible tissue is still an application problem. We conducted secondary data analysis on transcriptional profiles of 79 human tissues using Affymetrix U133a microarray. We found that expression among tissues belonging to central nervous system show distinctly similar pattern. The immune cells in peripheral blood are more comparable to leukemia/lymphoma on a transcriptome level. And differential co-expression patterns appear between tissue-groups of organ-free immune and leukemia/lymphoma.

SuA3 **10:30-12:10**
Room1
Topic: Computational methods and intelligence in modeling of molecular, cellular, multi-cellular behavior and design of synthetic biological systems

SuA3-1 **10:30-10:50**

Modelling the MAPK Signalling Pathway Using A Two-Stage Identification Algorithm

Padhraig Gormley, Kang Li, and George W. Irwin
Queen's University Belfast, UK

Signal transduction pathways describe the dynamics of cellular response to input signalling molecules at receptors on the cell membrane. The Mitogen-Activated Protein Kinase (MAPK) cascade is one of such pathways that are involved in many important cellular processes including cell growth and proliferation. This paper describes a blackbox MAPK model created using an advanced two-stage identification algorithm. Identification allows the unique features and dynamics of the pathway to be captured and also opens up the possibility of regulatory control design. In the approach described, an optimal model is obtained by performing model subset selection in two-stages, where the terms are first determined by a forward selection method and then modified using a backward selection model refinement. The simulation results demonstrate that the model selected using the two-stage algorithm performs better than with the forward selection method alone.

SuA3-2 **10:50-11:10**

Cellular Responding DNA Damage: An Improved Modeling of P53 Gene Regulatory Networks under Ion Radiation (IR)

Jinpeng Qi, Shihuang Shao, and Jimei Wu
Donghua University, China

As a vital anticancer gene, P53 controls the cell cycle arrest and cell apoptosis by regulating a series of genes and their complicated signal pathways. To simulate the self-defensive mechanisms of the cellular responding DNA damage under continuous Ion Radiation (IR), an improved model of the P53 gene regulatory networks is proposed at single cell level. The model can be used to simulate the kinetics of the double-strand breaks (DSBs) generating and their repair, ataxia telangiectasia mutated (ATM) and ARF activation, as well as the regulations of the P53-MDM2 feedback loop. Also, the model can predict the plausible outcomes of cellular responding DNA damage under different IR dose domains.

SuA3-3 **11:10-11:30**

Using Qualitative Technology for Modeling the Process of Virus Infection

Hailin Feng1,2, Chenxi Shao1,3,4
1.University of Science and Technology of China, China
2.ZheJiang Forestry University, China
3.Haerbin Institute of Technology, China
4.Anhui Province Key Laboratory of Software in Computing and Communication, China

The quantitative analysis of viral infection dynamical model can’t be processed easily due to the lack of complex quantitative knowledge in such biological system; therefore, the methods based on qualitative analysis become an alternative solution to researches in the complicated biological process. In this paper the qualitative technology is introduced to model and analyze the process of virus entry. A rough model is proposed first to be the foundation of further research. With more knowledge in the process, the framework is expanded by inserting the qualitative description of different kinds of factors that have interactive influence on the process of virus entry. The factors are described qualitatively in influencing degree, and the qualitative model is built based on the interaction among these influencing factors and the viruses and cells. The judging matrices are constructed according to the qualitative model and the coherence of these matrices is verified. A qualitative analysis about the process is given finally.

SuA3-4 **11:30-11:50**

A Lifecycle Model for Simulating Bacterial Evolution

B. Niu1,2, Y.L. Zhu1, X.X. He1,2, H. Shen1,2, Q.H. Wu3

1.Shenyang Institute of Automation, Chinese Academy of Sciences, China
2.Graduate School of the Chinese Academy of Sciences, China
3.University of Liverpool, UK
This paper presents a lifecycle model (LCM) to simulate bacterial evolution from a finite population of Escherichia coli (E.coli) bacteria. The potential of this approach is in relating the microscopic behaviors of single bacterial cell to the macroscopic effects of bacterial colonies. This can be accomplished via use of an individual-based modeling method under the framework of Agent-Environment-Rule (AER). Here, our study focus on investigating the behaviors at different developmental stages in E.coli lifecycle and developing a new biologically inspired methodology for complex dynamic systems. The experimental results through a varying environment demonstrates that our model can be used to study under which circumstances a certain bacterial behavior emerges, and also give a inspiration to design a new biological optimization algorithm being used for optimization of complex dynamic systems.

SuA3-5 **11:50-12:10**

A Simulation Study on the Encoding Mechanism of Retinal Ganglion Cell

Chao-Feng Cai, Pei-Ji Liang, Pu-Ming Zhang
Shanghai Jiao Tong University, China
Understanding how the retina encodes visual information is a key issue for the development of a retinal prosthesis. To study this issue, the neural retina is modeled as a retina module (RM) consisted of an ensemble of spatial-temporal (ST) filters and each ST filter simulates the input-output property of an individual ganglion cell (GC). Two receptive field (RF) models of retinal GC, the difference of Gaussians (DOG) model and the disinhibition (DIS) model, are employed to implement these ST filters respectively. RM performs the encoding operation from an input optical pattern to a group of parallel action potential (AP) trains. To assess the encoding efficiency of RF models, a central visual system module (VM) consisted of a group of artificial neural networks is employed to perform the decoding operation from AP trains to an output perceptual pattern. A matching error is defined as an index to quantify the similarity between the input optical pattern and the output perceptual pattern generated by VM. The simulation results suggest that the matching error declines dramatically when the DOG model is replaced by the DIS model, which implies that the encoding mechanism of the DIS model might be more effective than that of the DOG model.

SuA5 **13:30-15:30**
Room1
Topic: Computational methods and intelligence in organism modeling and biochemical networks and regulation

SuA5-1 **13:30-13:50**

Reverse Engineering Methodology in Broken Skull Surface Model Reconstruction

Luyue Ju1, Gaojian Zhong1, Xia Liu2
1.Shanghai University, China
2.Guizhou University, China
For various reasons, many people suffer from the bone defects, and how to solve this problem has become a hot topic internationally in the field of tissue engineering. Nowadays, the doctor diagnoses the state of the bone defect illness mainly depending on observing the CT images of patient; it mainly depends on the technique and experience of the doctor. In order to solve this problem, this paper focuses on using the Reverse Engineering technology to make the Skull-Repair-Technology efficient. During this process, we can construct the Repair-Sheet that fits the skull surface and then mold it. This method can shorten the time of operation, reduce the risk of operation.

SuA5-2 **13:50:14:10**

Modeling of Skin Thermal Pain: a Preliminary Study

Feng Xu1, Ting Wen1, Keith Seffen1, Tianjian Lu2
1.Cambridge University, UK
2.Xi'an Jiaotong University, China
Skin thermal pain is one of the most common problems for humans in everyday life. The understanding of the underlying physical mechanisms is still not clear, and modeling of them is very limited. In this paper, a holistic mathematical model for quantifying skin thermal pain sensation is developed. The model is composed of three interconnected parts: peripheral modulation of noxious stimuli, which converts the energy from a noxious thermal stimulus into electrical energy via nerve impulses; transmission, which transports these neural signals from the site of transduction in the skin to the spinal cord and brain; and modulation and perception in the spinal cord and brain. With this model, a direct relationship is built between the level of thermal pain sensation and the character of noxious stimuli.

SuA5-3 **14:10:14:30**

Investigation of a Hydrodynamic Performance of a Ventricular Assist Device after Its Long-Term Use in Clinical Application

Yuma Kokuzawa1, Tomohiro Shima1, Masateru Furusato1, Kazuhiko Ito1, Takashi Tanaka1, Toshihiro Igarashi2, Tomohiro Nishinaka2, Kiyotaka Iwasaki1, Mitsuo Umezu1
1.Graduate School of Waseda University, Japan
2.Tokyo Women's Medical University, Japan
A long-term durability of a ventricular assist device (VAD) is required due to a shortage of donor hearts for cardiac transplantation, but there is no analyzed pump data after long-term use. This study aimed to perform a comparative study between new VAD and VADs after long-term use. The hydrodynamic performance of the used Toyobo VADs (mean period of 5 months with the maximum of 12 months) was evaluated in a mock circulatory system, where a new VAD was used as a control. Although a remarkable difference was not observed in terms of mean flow rate, flow and pressure waveforms varied significantly. Then, the pressure-volume relationship of each pump was measured. It was found that the capacity of long-term

September 16, 2007 Sunday

SuA1 **8:30-10:10**
Room1
Invited session: Molecular Systems Biology

SuA1-1 **8:30-8:50**

Clustering Complex Networks and Biological Networks by Nonnegative Matrix Factorization with Various Similarity Measures

Rui-Sheng Wang1,5, Shihua Zhang2,3, Yong Wang2, Xiang-Sun Zhang2, Luonan Chen4,5,6,7
1.Renmin University of China, China
2.Academy of Mathematics and Systems Science, China
3.Graduate University of Chinese Academy of Sciences, China
4.Shanghai University, China
5.Osaka Sangyo University, Japan
6.ERATO Aihara Complexity Modelling Project, JST, Japan
7.The University of Tokyo, Japan

Identifying community structure in complex networks is closely related to clustering of data in other areas without an underlying network structure. In this paper, we propose a Nonnegative Matrix Factorization (NMF)-based method for finding community structure. We first evaluate several similarity measures, such as diffusion kernel similarity, shortest path based similarity on several widely well-studied networks. Then, we apply NMF with diffusion kernel similarity to a large biological network, which demonstrates that our method can find biologically meaningful functional modules. Comparison with other algorithms also indicates the good performance of our method.

SuA1-2 **8:50-9:10**

A New Hybrid Approach to Predict Subcellular Localization by Incorporating Protein Evolutionary Conservation Information

ShaoWu Zhang1, YunLong Zhang2, JunHui Li1, HuiFeng Yang1, YongMei Cheng1, GuoPing Zhou3
1.Northwestern Polytechnical University, China
2.First Aeronautical Institute of Air Force, China
3.Harvard Medical School, USA

The rapidly increasing number of sequence entering into the genome databank has created the need for fully automated methods to analyze them. Knowing the cellular location of a protein is a key step towards understanding its function. The development in statistical prediction of protein attributes generally consists of two cores: one is to construct a training dataset and the other is to formulate a predictive algorithm. The latter can be further separated into two subcores: one is how to give a mathematical expression to effectively represent a protein and the other is how to find a powerful algorithm to accurately perform the prediction. Here, an improved evolutionary conservation algorithm was proposed to calculate per residue conservation score. Then, each protein can be represented as a feature vector created with multi-scale energy (MSE). In addition, the protein can be represented as other feature vectors based on amino acid composition (AAC), weighted auto-correlation function and Moment descriptor methods. Finally, a novel hybrid approach was developed by fusing the four kinds of feature classifiers through a product rule system to predict 12 subcellular locations. Compared with existing methods, this new approach provides better predictive performance. High success accuracies were obtained in both jackknife cross-validation test and independent dataset test, suggesting that introducing protein evolutionary information and the concept of fusing multi-features classifiers are quite promising, and might also hold a great potential as a useful vehicle for the other areas of molecular biology.

SuA1-3 **9:10-9:30**

QSAR and Molecular Docking Study of a Series of Combretastatin Analogues Tubulin Inhibitors

JI Yu-Bin1, TIAN Ran1, LIN Wen-Han2
1.Harbin University of Commerce, China
2.Peking University, China

In this article, we study a series of Combretastatin compounds which undergo B ring transformation. First of all, Genetic function analysis(GFA) is adopted to study two-dimensional quantitative structure activity relationship(QSAR). The results demonstrate that Apol, PMI-mag, Dipole-mag, Hbond donor, RadOfGyration descriptors make the most significant contributions to the activities of this series of inhibitors; Comparative molecular field analysis (CoMFA) and comparative molecular similarity indices analysis(CoMSIA) are adopted to study three-dimensional quantitative structure activity relationship, both of which demonstrate strong predictive abilities. The tri-dimensional contour maps of CoMFA and CoMSIA provide explanations for the structure-activity relationship of Combretastatin compounds, and elucidate the effects of different substituents of B ring on inhibiting the activities of tubulin polymerization. And molecular docking was used to analyze and validate quantitative structure activity relationship models. The results of this study provide evidence for further designing and synthesizing tubulin inhibitors and conducting structure optimization.

SuA1-4 **9:30-9:50**

Systems Biology via Redescription and Ontologies: Untangling the Malaria Parasite Life Cycle

Samantha Kleinberg, Kevin Casey, and Bud Mishra
New York University, USA

Biological systems are complex and often composed of many subtly interacting components. Furthermore, such systems evolve through time and, as the underlying biology executes its genetic program, the relationships between components change and undergo dynamic reorganization. Characterizing these relationships precisely is a challenging task, but one that must be

VADs was reduced. Although a further study is required, these results suggested that a long-term use of VAD may cause a change in mechanical properties of polymer materials.

SuA5-4 14:30-14:50

An Adaptive Classifier Based on Artificial Immune Network

Zhiguo Li, Jiang Zhong, Yong Feng, ZhongFu Wu
Chongqing University, China

The central problem in training a radial basis function neural network is the selection of hidden layer neurons, which includes the selection of the center and width of those neurons. In this paper, we propose a new method to construct an adaptive RBF neural network classifier based on artificial immune network algorithm. A multiple granularities immune network (MGIN) algorithm is employed to get the candidate hidden neurons and construct an original RBF network including all candidate neurons, and a removing redundant neurons procedure is used to simplify the classifier finally. Some experimental results show that the network obtained tends to generalize well.

SuA5-5 14:50-15:10

Identification and Application of Nonlinear Rheological Characteristics of Oilseed Based on Artificial Neural Networks

Xiao Zheng, Guoxiang Lin, Dongping He, Jingzhou Wang, Yan You
Wuhan Polytechnic University, China

Oilseed would display the characteristics of viscous-elastic-plasticity during pressing. The apparatus and method were successfully developed to measure the rheological properties of rapeseed and dehulled rapeseed, in which creep test was used under different stress. By using of artificial neural networks, the identification model of nonlinear rheological characteristics of rapeseed and dehulled rapeseed were developed on the basis of the creep test. Results indicated that the model simulated the nonlinear rheological characteristics very well. Compared to date fitting method and theoretical analysis method, the method of identification of rheological characteristic for oilseeds by using artificial neural networks is both simple and effective. The critical pressing time of rapeseed and dehulled rapeseed were determined by using of simulated creep curves.

SuA5-6 15:10-15:30

AOC-by-self-discovery Modeling and Simulation for HIV

Chunxiao Zhao1,2, Ning Zhong2,3, Ying Hao1
1.Beijing University of Civil Engineering and Architecturee, China
2.Beijing University of Technology, China
3.Maebashi Institute of Technology, Japan

Among HIV, immune cell and drug, exhibit interactions that are usually not well understood and as a result, cannot be accurately modeled. In this paper, Modeling by AOC is to understand the dynamics of HIV infection and treatment. The use of AOC-by-self-discovery modeling was investigated. AOC-by-self-discovery methods try to adjust the system parameters automatically. To demonstrate the effects of therapies, we design and implement a HIV Computational Lab prototype. HIV Computational Lab is an AOC-based simulation of HIV immune dynamics that is currently being developed in NetLogo. It allows researches to investigate dependencies various immune responses to HIV. The HIV Computational Lab provides a good tool to characterize the process of HIV infection and study HIV drug treatment.

SuA7 15:50-18:10
Room1
Topic: Modeling and simulation of societies and collective behavior

SuA7-1 15:50-16:10

Detecting RNA Sequences using Two-Stage SVM Classier

Xiaoou Li1, Kang Li2
1.Departamento de Computacin CINVESTAV-IPN, Mxico
2.Queen's University Belfast, UK

RNA sequences detection is time-consuming because of its huge data set size. Although SVM has been proved to be useful, normal SVM is not suitable for classification of large data sets because of its high training complexity. A two-stage SVM classification approach is introduced for fast classifying large data sets. Experimental results on several RNA sequences detection demonstrate that the proposed approach is promising for such applications.

SuA7-2 16:10-16:30

A Stochastic Model for Prevention and Control of HIV/AIDS Transmission Dynamics

Min Xu, Yongsheng Ding, Liangjian Hu
Donghua University, China

In this paper, we first present a stochastic model of the proportion of the population infected with HIV against total population, and prove the existence and uniquess of its solution. Through computer simulation, we forecast the proportion of the population infected with HIV against the total population in the transmission course of AIDS in China in next 20 years. Especially, we study the control index of the transmission rate β to obtain its effect on the epidemic trend of AIDS when it fluctuates. As such, we present a strategy to adjust β to reach a certain control aim based on the analysis of the mean value and variance of the proportion.

SuA7-3 16:30-16:50

Simulation of Artificial Life of Bee's Behaviors

Bin Wu, Hongying Zhang, Xia Ni
Southwest University of Science and Technology, China

Based on the 'bottom-up' programming approach in Artificial Life, Finite-State Machine is adopted to describe the behavior of the individual bee, and the behavior in different period was realized in this paper. As a result, the interaction of the individual bee each other, individual bee and virtual environment produce the Emergence of

swarm's collective behaviors. Finally, we apply the graphical interfaces to realize the simulation.

SuA7-4 16:50-17:10

Hybrid Processing and Time-frequency Analysis of ECG Signal

Ping Zhang, Chengyuan Tu, Xiaoyang Li, Yanjun Zeng
Beijing University of Technology, China

A new simple approach basing on the histogram and genetic algorithm(GA) to efficiently detect QRS-T complexes of the ECG curve is described, so as to easily get the P-wave (when AF does not happen) or the f-wave (when AF happens). By means of signal processing techniques such as the power spectrum function，the auto-correlation function and cross-correlation function, two kinds of ECG signal when AF does or does not happen were successively analyzed, showing the evident differences between them.

SuA7-5 17:10-17:30

Modelling Pervasive Environments Using Bespoke & Commercial Game-Based Simulators

Marc Davies1, Vic Callaghan1, Liping Shen2
1.Essex University, UK
2.Shanghai Jiao Tong University, China

This paper details an ongoing investigation, linking intelligent buildings and computer game technology. Intelligent buildings are containers for life-sized organisms (people, pets etc), sustaining ecologies that evolve and interact in a symbiotic way with the technological infrastructure, which includes intelligent agents. This work explores how computer games software can be used to create a simulation tool for the development of new ubiquitous agent programs and environments. We report on our experiences of adapting a retail package, (Electronic Arts' Sims) and building our own bespoke simulator. We use a table to compare and summarise the strengths and weaknesses of each approach; the general conclusion being that there are significant benefits to be gained from adapting commercial games packages for use as professional simulation tools. Finally, we conclude the paper by describing our plans to apply this work to the development of a mixed-reality eLearning application.

SuA7-6 17:30-17:50

The Research of Artificial Animal's Behavior Memory based on Cognition

Xiaojuan Ban, Shurong Ning, Jing Shi, Dongmei Ai
University of Science and Technology Beijing, China

In some artificial systems, performing the realistic perception for actors，which will handle both the processes to simulate the sensing organs and identify, will spend most computational time. Unfortunately, this matter even ruins the result of decision based on perception. In order to reduce the computation cost from a systemic view and optimize the performance of system, a brand-new perceptual focuser was proposed. The perceptual focuser is the core of artificial animal sensation system, which provides the external environment and internal condition information for the behavior decision system. Artificial animal behavior memory formation is also the result of the focuser's analysis focusing. This paper proposes and analyzes two kinds of memory-form algorithm. The quadratic method to food spot which gains has made the variance computation, rejects noise spots which are apart from other normal spots, so that it obtains the expected food distribution position. In view of the quadratic method's insufficiency, the improvement mean-cluster algorithm profits from the data mining theory, which makes the noise-spot-rejection accurately. Select the algorithm according to the different situation, which can make the focuser achieve the validity of the realization of artificial animal food memory.

SuA7-7 17:50-18:10

Quantifying dynamic cross-talk of three MAPK signaling pathways in yeast

Tao Peng, Xiufen Zou
Wuhan University, China

Cells sense several kinds of stimuli and trigger corresponding responses through signaling pathways. As a result, cells must process and integrate multiple signals in parallel to maintain specificity and avoid erroneous cross-talk. In this study, we analyzed the dynamics of cross-talk between signaling pathways using mathematical modeling. Based on available literature and experimental data, we developed an integrative mathematical model for the mating, invasive growth and stress-responsive mitogen-activated protein kinase (MAPK) cascades in yeast Saccharomyces cerevisiae. From numerical simulations, we observed that (1) when all three pathways were responsive and stimulated, the HOG pathway inhibited the response of the pheromone and filamentous growth pathways in terms of MAPK activity and transcriptional activity. (2) In the Hog1 and Pbs2 mutants, when only the HOG pathway was stimulated, the high osmotic stress can stimulate the pheromone and the filamentous pathways, but the level of the output was lower than when the HOG pathway was not stimulated. The results demonstrated that the yeast MAPK signaling network can achieve specificity and fidelity using different mechanisms, such as scaffolding, cross-inhibiting, and feedback control, in spite of the cross-talk between the relevant pathways. Our results, which was in a good agreement with published quantitative and qualitative data, provided new insights into the integration and cross-talk of relevant signaling pathway in a biological system.

SuA2 8:30-10:10
Room2
Topic: Computational intelligence in bioinformatics and biometrics

SuA2-1 8:30-8:50

Support Vector Machine for Prediction of DNA-binding Domains in Protein-DNA Complexes

Jiansheng Wu, Hongtao Wu, Hongde Liu, Haoyan Zhou, Xiao Sun
Southeast University, China

In this study, we present a classifier which takes an amino

acid sequence as input and predicts potential DNA-binding domains with support vector machines (SVMs). We got amino acid sequences with known DNA-binding domains from the Protein Data Bank (PDB), and SVM models were designed integrating with four normalized sequence features(the side chain pKa value, hydrophobicity index , molecular mass of the amino acid and the number of isolated electron pairs) and a normalized feature on evolutionary information of amino acid sequences. The results show that DNA-binding domains can be predicted at 74.28% accuracy, 68.39% sensitivity and 79.76% specificity, in addition, at 0.822 ROC AUC value and 0.549 Pearson's correlation coefficient.

SuA2-2 **8:50-9:10**

On a Pitch Alteration Technique in Transformation Domain of Speech Signal

JongKuk Kim, DeokSu Na, MyungJin Bae
University of Soongsil, Korea

In the case of speech synthesis, the waveform coding method with high quality is mainly used to the synthesis by analysis. Because the parameters of this coding method are not classified as both excitation and vocal tract parameters, it is difficult to apply the waveform coding method to the synthesis by rule. So, in order to apply it, a pitch alteration is required for the prosody control. In the speech synthesis method by the conventional Pitch Synchronous Overlap Add (PSOLA) technique, which is applying symmetric window function to asymmetric speech waveform, the unbalance phenomenon of energy is occurred by overlapped degree of pitch interval adjustment, so the exact pitch detection is requested. In order to overcome some spectral distortion which is caused by the pitch alteration of the speech signal, we propose a new pitch conversion technique that can convert asymmetric waveform to symmetric one without any pitch information. As a result, we can obtain an average spectral distortion ratio of 4.6% according to the pitch alteration ratio.

SuA2-3 **9:10-9:30**

An Improved Algorithm on Detecting Transcription and Translation Motif in Archaeal Genomic Sequences

Minghui Wu1,2, Xian Chen3, Fanwei Zhu1, Jing Ying1,2
1.Zhejiang University, China
2.Zhejiang University City College, China
3.University of Alberta, Canada

Identifying the binding sites and promoters in the genomes remains one of the most research topics in computational biology in past ten years. In the upstream region of the start codon, there exist transcription and translation motifs whose distances and patterns vary among different genomic sequences. However, the existing computational approaches for detecting them are mostly general-purpose. For archaea, binding motifs are almost undiscovered as they are more hidden than bacteria or eukaryotes. In this report, an improved algorithm based on PWM (position-weight matrix) and Gibbs Sampler was proposed for finding any number of patterns in a given range. Experiments using this algorithm were done to detect the potential binding motifs in archaeal genomic sequences, and the results were analyzed among different settings and species. The comparison with biological experiments result shows that the improved algorithm is feasible to find more significant patterns for archaea than the traditional approaches.

SuA2-4 **9:30-9:50**

Comprehensive Fuzzy Evaluation Model for Body Physical Exercise Risk

Yizhi Wu1, Yongsheng Ding1, Hongan Xu2
1.Donghua University, China
2.East China Normal University, China

It is very important and difficult to determine whether the person who is undertaking physical exercise is safe. A unique approach based on both analytic hierarchy process (AHP) and fuzzy comprehensive evaluation (FCE) is presented to evaluate exercise risk. First, a new evaluation model combining the above two methods, AHP-FCE, is established by applying the fuzzy mathematics into hierarchical assessment. Then, various physical exercises relevant factors are analyzed and represented. In addition, steps of the AHP-FCE based physical exercise evaluation are set up. Finally, an actual calculation example is used to verify the feasibility of the method.

SuA2-5 **9:50-10:10**

Mode Attenuation in Planar Optical Waveguide Biochemical Sensors

Renling Zou1, Baoxue Chen1, Haihong Wang1, Xiufang Hu1, Mamoru Iso2
1.University of Shanghai for Science and Technology, China
2.Tokyo University of Agriculture and Technology, Japan

Generally, the waveguide absorbance is highly sensitive to the specific launching conditions at the waveguide input in planar optical waveguides biochemical sensors. In this paper, Asymptotic attenuation coefficients were calculated in order to optimizing waveguide structure. The attenuation in the waveguide has been found to depend strongly on the mode number and the depth of the waveguide （h） in multimode waveguides. The sensitivity is related to waveguide structure parameter （ns, ng, h）, so the sensitivity of this waveguide sensor is increased by optimizing waveguide structure parameter. Experimental results show excellent agreement with theory.

SuA4 **10:30-12:10**
Room2
Topic: Brain stimulation, neural dynamics and neural Interfacing

SuA4-1 **10:30-10:50**

The Study on Internet-based Face Recognition System using PCA and MMD

Jong-Min Kim
Chosun University, Korea

The purpose of this study was to propose the real time face recognition system using multiple image sequences for network users. The algorithm used in this study aimed to optimize the overall time required for recognition

process by reducing transmission delay and image processing by image compression and minification. At the same time, this study proposed a method that can improve recognition performance of the system by exploring the correlation between image compression and size and recognition capability of the face recognition system. The performance of the system and algorithm proposed in this study were evaluated through testing.

SuA4-2 **10:50-11:10**

Detecting spatiotemporal nonlinear dynamics in resting-state of human brain based on fMRI datasets

Xiaoping Xie1, Zhitong Cao1, Xuchu Weng2
1.Zhejiang University, China,
2.Chinese Academy of Sciences, China

In this work, a nonlinear dynamics method, coupled map lattices (CML), was applied to fMRI datasets to examine the spatiotemporal properties of BOLD resting state fluctuations. Spatiotemporal Lyapunov Exponent (SPLE) was calculated to study the deterministic nonlinearity in resting state human brain of nine subjects based on fMRI datasets. The results show that there is nonlinearity and determinism in resting state brain. Furthermore, the results demonstrate that there is a spatiotemporal chaos phenomenon in resting state brain, suggesting that fluctuations in resting state fMRI data cannot be fully attributed to nuclear magnetic resonance noise. At the same time, the spatiotemporal chaos phenomenon suggests that the correlation between voxels is variational with time and there is dynamic functional connection or network in resting state brain.

SuA4-3 **11:10-11:30**

Worm 5: Pseudo-organics Computer and Natural Live System

Yick Kuen Lee1, Ying Ying Lee2
1.Sun Yat-sen University, China
2.University of Leeds, UK

Life began hundred million years ago; it started from simple inorganic substances to intricate multi-cellular organics. Gradually, the brains of higher animals developed emotions and intelligence. These are well illustrated by the learning abilities and social behaviors of man. Those intelligent activities, progress from simple to complicate, primitive to sophisticated processes from incarnate to abstract. Man started to create artificial intelligent to enhance their brain capabilities sixty years ago. Here we are making a comparison between the natural and artificial intelligent, and see what we can emulate more from Nature. And disclose the author's point of view about the creation of natural lives.

SuA4-4 **11:30-11:50**

Hemodynamic Analysis of Cerebral Aneurysm and Stenosed Carotid Bifurcation Using Computational Fluid Dynamics Technique

Yi Qian1, Tetsuji Harada1, Koichi Fukui1, Mitsuo Umezu1, Hiroyuki Takao2, Yuichi Murayama2
1.Waseda University, Japan
2.The Jikei University, Japan

Cerebrovascular diseases are one of the three major mortalities in Japan, such as the rupture of cerebral aneurysm and cerebral infarction caused by carotid stenosis. The growth mechanism of the cerebral aneurysm and carotid stenosis has not been clearly understood. In this research, we are introducing a numerical simulation tool; Computational Fluid Dynamics (CFD) technique, to simulate and predict the hemodynamics of blood passing through the cerebral aneurysms and stenosed carotid arteries. The results of a ruptured and an unruptured cerebral aneurysm were compared. Energy losses were calculated in ruptured and unruptured cerebral aneurysms, the results were 167 Pa and 6.3 Pa respectively. The results also indicated that the blood flows took longer residence inside of bleb of the ruptured aneurysm. The maximum wall shear stress was observed at 70% stenosis from the simulation results of stenosed carotid bifurcation. The result qualitatively agrees with classical treatments in carotid bifurcation therapy.

SuA4-5 **11:50-12:10**

Active/Inactive Emotional Switching for Thinking Chain Extraction by Type Matching From RAS

JeongYon Shim
Kangnam University, Korea

During the memorizing process, knowledge is memorized closely related to the emotional state. The emotional factor also effects on the decision making process as well as memorization. Accordingly in this paper Reticular Activating System was designed and the knowledge management strategy considering the emotional switching was proposed. We applied this system to the virtual memory and tested the results.

SuA6 **13:30-15:30**
Room2
Topic: Biological and biomedical data integration, mining and visualization

SuA6-1 **13:30-13:50**

Bi-Hierarchy Medical Image Registration Based on Steerable Pyramid Transform

Xiuying Wang1, David Feng1,2
1.The University of Sydney, Australia
2.Hong Kong Polytechnic University, China

Image registration is playing a more and more important role in facilitating the smart use of widely available and complementary information from multiple imaging resources. To improve the efficiency and accuracy of medical image registration, in this paper, a bi-hierarchy registration method is presented. Firstly, on the basis of steerable pyramid transform with property of transformation-invariance, the images will be decomposed into multi-scale and multi-band representation. Then, to avoid transformation error accumulation and magnification during the parameter transmission, the registration will be performed only in the lowest-resolution hierarchy and the highest-resolution hierarchy. The experiments on medical images demonstrate that the proposed registration is of high performance and is robust to noise.

SuA6-2 **13:50-14:10**

The Chaos Model Analysis Based on Time-Varying Fractal Dimension

Jianrong Hou1, Dan Huang1, Hui Zhao2
1.Shanghai Jiaotong University, China
2.East China Normal University, China

An evaluation formula of varying-time *Hurst* index is established by wavelet and the algorithm of varying-time index is presented, which is applied to extract the characteristics of the atrial fibrillation in this paper. The diagnosis of atrial fibrillation curve figure can be done at some resolution ratio level. The results show that the time-varying fractal dimension rises when atrial fibrillation begins, while it falls when atrial fibrillation ends. The begin and the end characteristics of atrial fibrillation can be successfully detected by means of the change of the time-varying fractal dimension. The result also indicates that the complexity of heart rate variability (HRV) decreases at the beginning of atrial fibrillation.

SuA6-3 **14:10-14:30**

Classification of Single Trial EEG Based on Cloud Model for Brain-Computer Interfaces

Shaobin Li, Chenxi Shao
University of Science and Technology of China, China

A novel feature extraction method based on cloud model for EEG classification is proposed in the paper. The cloud model can transform numerical data to qualitative concept described by a group of characteristics. It provides a new way for concept induction in machine learning. Classification of single trial EEG recorded in a 'self-paced key typing' experiment is made through feature extraction based on cloud model and linear regression method for the classification of feature vectors. Results of up to 90% classification accuracy on test data set were obtained. The results show that compared with other methods, the feature extraction and translation method for EEG classification in this paper is simple and effective.

SuA6-4 **14:30-14:50**

DNA Motif Sampler on Evolutionary Mixtures with Mutation-Insertion-Deletion

Junfeng Liu1, Liang Chen2, Hongyu Zhao3
1.West Virginia University, USA
2.University of Southern California, USA
3.Yale Center for Statistical Genomics and Proteomics, USA

The evolutionary conservation of transcriptional regulatory elements implies that the noncoding sequence data for mouse, rat and human offers great potential for more effective and powerful transcriptional regulatory elements detection. This article proposes a novel Bayesian DNA motif sampler considering the evolutionary process on evolutionary mixtures with mutation, insertion, and deletion (MID). Our algorithms circumvent laborious multiple alignment and sensitive position specific weight matrix (PPWM) and are able to decode potential transcription factor binding sites automatically, efficiently and objectively. The comprehensive sampling-based probabilistic quantitative evolution models estimate all characteristic parameters, some of which can not be done by MLE or EM algorithms. Different species are characterized by individual phylogenetic parameters. We also discuss parallel and phylogenetic tree evolution model. We compare Needleman-Wunsch global alignment and random simulation alignment methods for motif evolution likelihood function reconstrution with regard to MID combinations. We test the algorithms under either partial simulation or multiple types of real biological sequence data.

SuA6-5 **14:50-15:10**

Comparisons of Chemical Synapses and Gap Junctions in the Stochastic Dynamics of Coupled Neurons

Jiang Wang, Xiumin Li, Dong Feng
Tianjin University, China

We study the stochastic dynamics of three Fitz Hugh-Nagumo neurons with chemical coupling and electrical coupling (gap junction) respectively. For both of the coupling cases, optimal coherence resonance and weak signal propagation can be achieved with intermediate noise intensity. Through comparisons and analysis, we can make conclusions that chemical synaptic coupling is more efficient than the well known linear electrical coupling for both coherence resonance and weak signal propagation. We also find that neurons with parameters locate near the bifurcation point (*canard regime*) can exhibit the best response of coherence resonance and weak signal propagation.

SuA6-6 **15:10-15:30**

The Effect of Map Information on Brain Activation during a Driving Task

Tao Shang1, Shuoyu Wang2, Shengnan Zhang1
1.Shenyang University of Technology, China
2.Kochi University of Technology, Japan

Until now, GPRS/GPS/GIS based on vehicle navigation and monitoring systems have been popularly developed to satisfy the demand for the intelligent transportation system (ITS). Such systems provide the large traffic convenience to drivers, but at the same time attach more burdens to drivers for learning about map information. Hence it is worth further verifying the negative effect of vehicle navigation and monitoring systems on drivers. Considering that human driving behavior is strongly relevant to cognitive characteristics, this study will address to the effect of vehicle navigation systems on drivers by means of measuring and analyzing the cognitive state inside brain. In this paper, a relatively new method of multi-channel near-infrared spectroscopy (NIRS) was used to investigate the brain activation by independently manipulating the cognitive demand in the different cases of a driving simulator. Experimental results indicated that, compared with the case of no map information available, there is no more obvious priority of activation for left brain and right brain in the case of map information available. Meanwhile, there seems to be a complete activation for the prefrontal cortex of left and right brain, suggesting that

GPRS/GPS/GIS based vehicle navigation systems may exhaust drivers more easily so as to bring about more danger than traffic convenience under driving environment.

SuB5-a 15:50-18:10
Room2
Topic: Advanced evolutionary computing theory, algorithms and application-1

SuB5-a-1 15:50-16:10
A Modified Coevolutionary Algorithm for Multiperiod Scheduling of Batch Plants under Uncertainty
Jin Zhu1, Bin Jiao2, Xingsheng Gu1
1.East China University of Science and Technology, China
2.Shanghai DianJi University, China
A modified coevolutionary genetic algorithm (CEGA) has been proposed for the scheduling of batch plants under demand uncertainty. An effective crossover operation and three mutation operations given in the CEGA are used to guarantee the feasibility of the solution. The multiperiod scheduling of multiproduct batch plants under demand uncertainty involves the constraints of material balances and inventory constraints, as well as the penalty for production shortfalls and excess. A two-stage stochastic model (TSM) is proposed. It involves the maximization of the expected profit subject to the satisfaction of single and multiple product demands with probability level. The stochastic elements of TSM are expressed with equivalent deterministic optimization models, eliminating the need for discretization or sampling techniques. A test problem involving 12 correlated uncertain product demands is addressed. Three alternative models, including some of the features of the TSM model are defined. Simulation results demonstrate the effectiveness of CEGA algorithm. The optimization performance is improved significantly in comparison with the standard genetic algorithm.

SuB5-a-2 16:10:16:30
Gene Optimization: Computational Intelligence from the Natures and Micro-mechanisms of Hard Computational Systems
Yuwang Chen, Yongzai Lu
Shanghai Jiaotong University, China
Research on evolutionary theory and statistic physics has provided computer scientists with powerful methods for designing intelligent computational algorithms, such as simulated annealing, genetic algorithm, extremal optimization, etc. These techniques have been successfully applied to a variety of scientific and engineering optimization problems. However, these methodologies only dwell on the macroscopic behaviors (i.e., the global fitness of solutions) and never unveil the microscopic mechanisms of hard computational systems. Inspired by Richard Dawkins's notion of the "selfish gene", the paper explores a novel evolutionary computational methodology for finding high-quality solutions to hard computational systems. This method, called gene optimization, successively eliminates extremely undesirable components of sub-optimal solutions based on the local fitness of genes. A near-optimal solution can be quickly obtained by the self-organized evolutionary processes of computational systems. Simulations and comparisons based on the typical NP-complete traveling salesman problem demonstrate the effectiveness and efficiency of the proposed intelligent computational method.

SuB5-a-3 16:30-16:50
Parallel Immune Quantum Evolutionary Algorithm for Multi-modal Function Optimization
Xiaoming You1, Sheng Liu1, Dianxun Shuai2
1.Shanghai University of Engineering Science, China
2.East China University of Science and Technology, China
A novel Multi-modal Parallel Immune Quantum Evolutionary Algorithm based on learning mechanism (MPIQEA) is proposed. In the algorithm, all individuals are divided into some independent sub-colonies, called universes. Information among the universes is exchanged by adopting emigration based on improving learning mechanism and adaptive quantum interaction simulating entanglement of quantum. The use of an immune algorithm provides this methodology with superior local search ability; several antibody diversification schemes were incorporated into the MPIQEA in order to improve the balance between exploitation and exploration. It can maintain quite nicely the population diversity and help to obtain the multi-modal optimal solutions rapidly. Two benchmark examples in multi-modal optimization problems were used to evaluate the proposed approach. The results indicate the effectiveness of MPIQEA.

SuB5-a-4 16:50-17:10
An Evolutionary Algorithm for Dynamic Multiobjective Optimization
Yuping Wang
Xidian University, China
In this paper, first, the dynamic multi-objective optimization problem (DMOP) is approximated by a series of static multi-objective optimization problems (SMOP) by dividing the time period into several equal subperiods. In each subperiod, the dynamic multi-objective optimization problem is seen as a static multi-objective optimization problem by taking the time parameter fixed. Second, the each static multi-objective optimization problem is transformed into a two-objective optimization problem based on two re-defined objectives. Third, a new crossover operator and mutation operator adapting to the environment changing are designed. Based on these, a new evolutionary algorithm is proposed. The simulation results indicate the proposed algorithm can effectively track the varying Pareto fronts with time.

SuB5-a-5 17:10-17:30
The Study on Chaotic Anti-control of Heart Beat BVP System
Lü Ling, Chengye Zou, Hongyan Zhao
Liaoning Normal University, china
The chaotic anti-control of the Bonhoeffer-Van der Pol system (BVP system) is investigated using the method of Lyapunov function, and the chaotifying of the BVP system

is successfully realized. Taking the BVP system and the forced Brusselator system for example, the design project of controller is given, and the structure of error system is constructed between the state of the BVP system and that of the forced Brusselator system, leading the BVP system to track strictly the dynamical behavior of the forced Brusselator system.The control method also can be used to some systems of arbitrary dimensions.

SuB5-a-6 **17:30-17:50**

Donor Recognition Synthesis Method Base on Simulate Anneal

Chen Dong, Yingfei Sun
Graduate University of Chinese Academy of Sciences, China

The recognition of splicing sites is an important step in gene recognition. We introduce a synthesis method for splicing sites prediction based on short sequence pattern and long sequence pattern. There are some weights in short sequence pattern and long sequence pattern. We regulate weights by simulated anneal. Applying the method to recognize both the true and false splicing sites, the result shows true positive rate and false positive rate and compared with GeneSplicer.

SuB5-a-7 **17:50-18:10**

A Bi-Level Programming Model for Environment-Oriented Guidance Management Based on Particle Swarm Optimization

Chaozhong Wu, Xinping Yan, Zhen Huang, Nengchao Lv
Wuhan University of Technology, China

Traffic guidance has been widely considered as an effective method to optimize traffic objectives through changing road users' route choice. Road pricing is used to optimize environmental objective in this study. A bi-level programming model for environment-oriented guidance was proposed. The particle swarm optimization algorithm was developed for solving the proposed model. A hypothetical case was developed to apply and validate the bi-level programming model. The model could be used to guide vehicles allocation to achieve minimized mobile emissions in traffic network. Decision makers can generate and adopt optimal road pricing plans based on the proposed model to achieve traffic and environmental policies.

SuB1 **8:30-10:10**
Room3
Invited session: Network dynamics

SuB1-1 **8:30-8:50**

Frequency Synchronization of a Set of Cells Coupled by Quorum Sensing

Jianbao Zhang, Zengrong Liu, Ying Li, Luonan Chen
Shanghai University, China

Collective behavior of a set of cells coupled by quorum sensing is a hot topic of biology. Noticing the potential applications of frequency synchronization, the paper studies frequency synchronization of a set of cells with different frequencies coupled by quorum sensing. By phase reduced method, the multicell system is transformed to a phase equation, which can be studied by master stability function method. The suffcient conditions for frequency synchronization of the multicell system is obtained under two general hypotheses. Numerical simulations confirm the validity of the results.

SuB1-2 **8:50-9:10**

Phase Synchronization of Circadian Oscillators Induced by a Light-Dark Cycle and Extracellular Noise

Ying Li, Jianbao Zhang, Zengrong Liu
Shanghai University, China

In mammals, the master circadian pacemaker is considered the suprachiasmatic nucleus (SCN) of the hypothalamus. Individual cellular clocks in SCN, the circadian center, are integrated into a stable and robust pacemaker with a period length of about 24 hours, which are remarkably accurate at timing biological events despite the randomness of their biochemical reactions. In this paper, we study the effect of the Light-Dark cycle and environment noise on the daily rhythms of mammals and give some numerical analysis. The results show that the environment noise makes for phase synchronization but it can not make the oscillators get phase synchronization with period of 24-h. On the contrary, the threshold of the strength of light that makes the oscillators to get the phase synchronization with period of 24-h with environment noise is larger than that in the case without environment noise.

SuB1-3 **9:10-9:30**

Nonlinear-estimator-based Robust Synchronization of Hodgkin-Huxley Neurons

Lingling Tian1, Donghai Li2, Xianfang Sun1
1.Beijing University of Aeronautics & Astronautics, China
2.Tsinghua University, China

A strategy is designed to synchronize two modified Hodgkin-Huxley neuronal systems under the influence of externally applied periodic stimulus and extremely low frequency (ELF) external electrical field. By transforming the dynamics of the error synchronization into the canonical form, a robust adaptive stabilization technique with least prior knowledge is used to stabilize the discrepancy system at the origin. Without directly affecting the other three internal states, all of the four states can all be synchronized. The designed algorithm considers incomplete state measurement and no detailed model of the system to guarantee robust stability (in fact, robust synchronization). The construction of the designed synchronization controller is easy to achieve and independent of the exact drift function of the system model. As a promising adaptive synchronization approach, it is expected to be applied to solve other synchronization problems effectively.

SuB1-4 **9:30-9:50**

T-S Fuzzy Sliding Mode Controllers for Nonlinear Systems

Feng Qiao1, Quanmin Zhu2, Alan Winfield2, Chris Melhuish2
1.Shenayng Jianzhu University, China

2.University of the West of England Frenchay Campus, UK
A novel sliding mode controller based on Takagi-Sugeno fuzzy model is designed for a class of nonlinear systems to tackle the nonlinear control problems with modelling uncertainties, time varying parameter fluctuations and external disturbances. A numerical example is simulated to verify the performances of the proposed control strategy, and the simulation results show that the controller designed is more effective than the conventional sliding mode controller in enhancing the robustness of control systems with high accuracy.

SuB1-5 **9:50-10:10**

Intelligent MAC model for traffic scheduling in IEEE 802.11e wireless LANs

Rongbo Zhu1, Jiangqing Wang1, Maode Ma2
1.South-Central University for Nationalities, China
2.Nangyang Technological University, Singapore

IEEE 802.11e hybrid coordination function (HCF) medium access control (MAC) protocol aims to provide quality of service (QoS) wireless local area networks (WLANs), which includes a new access mechanism, called enhanced distributed channel access (EDCA), and a polling-based scheme, called HCF controlled channel access (HCCA). In this paper, focusing on the problem of improving QoS in a mixed EDCA and HCCA scenario, an intelligent MAC model for traffic scheduling located at the QoS-enhanced access point (QAP) is proposed. The proposed MAC model includes two parts: tow status estimators and an adaptive scheduler. The model not only takes into account the requirements of traffic streams (TSs) such as through-put, delay and priority, but also takes into account current system status. In order to evaluate current system status, decide call admission control and reserve resource accurately, the MAC model employs an unsaturation EDCA model in EDCA mode and a dynamic HCCA scheduling algorithm in HCCA mode. With the requirements information sent by TSs and the evaluated system status, the scheduler adaptively schedules TSs to transmit frames in the appropriate access mode. Simulation results prove the effectiveness of our approach and demonstrate that the proposed MAC model is effective and significantly improves the QoS in terms of throughput and delay metrics.

SuB3-a **10:30-12:10**
Room3
Topic: Intelligent modeling, monitoring, and control of complex nonlinear systems-1

SuB3-a-1 **10:30-10:50**

The Research of Two-layer Networked Learning Control for Complex plant

Dajun Du1, Minrui Fei1, Kang Li2
1.Shanghai University, China
2.Queen's University Belfast, UK

The majority of researches are carried out on linear NCS, little has been done so far to investigate nonlinear NCS with more complex NCS architecture for nonlinear plants. The main objective of this paper is to propose two-layer networked learning control system architecture that is suitable for complex plants. In proposed architecture, the local controller communicates with the sensors and actuators that are attached to the plant through the first layer communication network, and the network is typically some kind of field bus dedicated to the real-time control. Through the second layer communication network, local controller also communicates with computer systems that typically functions as learning agent. For such a learning agent, firstly, a packet-discard strategy is developed to counteract network-induced delay, data packets that are out of order, and data packet loss. Then cubic spline interpolator is employed to compensate lost data. Finally, the output of learning agent using reinforcement learning neural network is used to dynamically tune the control signal of local controller. Simulation results of a nonlinear heating, ventilation and air-conditioning (HVAC) system demonstrate the effectiveness of the proposed architecture.

SuB3-a-2 **10:50-11:10**

Three-dimensional dynamic modeling of robotic fish: simulations and experiments

Junzhi Yu1, Lizhong Liu2, Min Tan1
1.Institute of Automation, CAS, China
2.Peking University, China

This paper deals with a three-dimensional (3-D) dynamic model for a free-swimming, multi-link robotic fish to predict the dynamic characteristics of the fish system within the Schiehlen's multi-body dynamics framework. The robotic fish, according to propulsive mechanisms employed by fish, propels itself using lateral oscillation and achieves a climb or descent maneuver exploiting a pair of artificial pectoral fins. Mechanically, the robotic fish consists of a stiff head, a flexible rear body and an oscillating lunate caudal fin, which can simply be viewed as an open, treed multi-body system. The kinematic analysis is then integrated with hydrodynamic analysis on multiple moving elements to derive complete dynamic equations in a form suited for controller design and computer simulation. A variety of 3-D locomotor behaviors, through regulating parametric sets, can be reproduced. Numerical simulations and actual experiments on degenerative planar swimming and combined motions are finally compared, which partially demonstrates the effectiveness of the proposed model.

SuB3-a-3 **11:10-11:30**

A Modified Dynamic Model for Shear Stress Induced ATP Release from Vascular Endothelial Cells

Cheng Xiang1, Lingling Cao1, Kairong Qin2,3, Zhe Xu3, Ben M. Chen1
1.National University of Singapore, Singapore
2.Shanghai Jiao Tong University, China
3.Fudan University, China

A modified dynamic model is proposed for shear stress induced adenosine triphosphate (ATP) release from endothelial cells (ECs) in order to incorporate the activation mechanism by time-varying shear stress. The dynamic behavior of ATP concentration at the endothelium-fluid interface by viscous shear flow is

investigated via simulation studies. The numerical results demonstrate that the ATP concentration against time at the endothelium-fluid interface predicted by the modified dynamic ATP release model is more consistent with the experimental observations than that predicted by static ATP release model. The different behaviors of ATP concentration predicted by the original dynamic model and the new one are also compared and analyzed.

SuB3-a-4 **11:30-11:50**

Neural Network Inverse Control for Turning Complex Profile of Piston

Tingzhang Liu, Xiao Yang, Jian Wang
Shanghai University, China

Advanced internal combustion engine piston is designed with middle-convex contour and variable ellipticity section for better working performance. Machining system shows significantly multi-input multi-output and nonlinear behaviors when turning this piston profile on NC lathe. These behaviors lead to an obvious error between machined parts to the desired profile. Traditional error compensation method for linear system cannot assure the required accuracy. Therefore, an artificial neural network (NN) inverse control method is proposed for high profile accuracy. A multilayered feedforward neural network is designed for this multi-input multi-output system and trained off-line to identify the inverse model of the machining system. Then the inverse model is employed to tune the system online. It is shown, by experiments of piston turning, that this control scheme can improve the machining accuracy effectively.

SuB3-a-5 **11:50-12:10**

Development of the Controller for Oxygen Supply System based on Heart Rate

Mi-Hyun Choi, Hang-Woon Lee, Ji-Hun Kwon, Gye-Rae Tack, Bongsoo Lee, Jae-Hun Jun, Soon-Cheol Chung
Konkuk University, Korea

The purpose of this study was to develop a controller for oxygen supply system based on the heart rate to assist the exercise of cardiac patients, elderly people, and normal people. Proposed system works as follows: After QRS signal is digitized using filter, comparator, and timer, MCU (Micro Controller Unit) receives it as an input signal and the calculated heart rate (BPM, bit per minute) is displayed at the LCD panel. The oxygen supply system is controlled by comparing the calculated heart rate with the predefined heart rate. If measured heart rate is greater than the predefined heart rate, oxygen is supplied and if not, oxygen is not supplied. The stable operation of this system was verified through actual experiments.

SuB3-b **13:30-15:30**
Room3
Topic: Intelligent modeling, monitoring, and control of complex nonlinear systems-2

SuB3-b-1 **13:30-13:50**

In Silico Drug Action Estimation from Cardiac Action Potentials by Model Fitting in A Sampled Parameter Space

Jianyin Lu1, Keichi Asakura2, Akira Amano1, Tetsuya Matsuda1
1.Kyoto University, Japan
2.Research Laboratories, Nippon Shinyaku Co. Ltd., Japan

Model-based predictive approaches have been receiving increasing attention as a valuable tool to reduce high development cost in drug discovery. Recently developed cardiac cell models are integrated with major ion channels and capable of reproducing action potentials (AP) precisely. In this work, a model-fitting-based approach for estimating drug action from cardiac AP recordings is investigated. Giving a test AP, the activities of involved ion channels can be determined by fitting the cell model to reproduce the test AP. Using experimental APs recordings both before and after drug dose, drug actions can be estimated by changes in activity of corresponding ion channels. Local-gradient-based optimization methods are too time-consuming due to the high computational cost of cardiac cell models. A fast approach using only pre-calculated samples to improve computational efficiency is addressed. The searching strategy in the sampled space is divided into two steps: in the first step, the sample of best similarity comparing with the test AP is selected; then response surface approximation using the neighboring samples is followed and the estimation value is obtained by the approximated surface. This approach showed quite good estimation accuracy for a large number of simulation tests. Also results for animal AP recordings from drug dose trials were exemplified in which case the ICaL inhibition effect of Nifedipine and IKr inhibition effect of E4031 were correctly discovered.

SuB3-b-2 **13:50:14:10**

A Bayesian Approach to Support Vector Machines for Classifying High-dimensional Biodata

Jiangsheng Yu, Huilin Xiong, Xue-wen Chen
Peking University, China

Once the maximal margin of a support vector machine (SVM) is determined, we propose a Bayesian approach to determining the separating hyperplane which minimizes the Bayes error in some derived direction. In the proposed model, all the parameters are estimated by the reversible jump Markov chain Monte Carlo (RJMCMC) strategies in a fully Bayesian way, and the location parameter of decision boundary is finally described by a posterior distribution. The experimental results on some high-throughput biodata sets demonstrate the promising performance and robustness of this novel classification method.

SuB3-b-3 **14:10:14:30**

Robust H-infinity Control of Discrete Switched Systems with Time Delay

Yang Song1,2, Jian Fan1,2, Minrui Fei1,2
1.Shanghai Key Laboratory of Power Station Automation Technology, China
2.Shanghai University, China

This paper considers the robust H-infinity control of discrete-time switched systems with time delay. The

methodology of robust H-infinity control is proposed by using state feedback and constructing admissible switching sequences of which the average dwell time (ADT) is limited within a certain bound. The bound of ADT can be calculated by the formulations presented in this paper. Finally, a numerical example is given to illustrate the effectiveness of the proposed method.

SuB3-b-4 **14:30-14:50**

Networked Control System: Survey and Directions

Xianming Tang, Jinshou Yu
East China University of Science and Technology, China

This paper extends a survey on Networked Control Systems (NCSs) published in previous papers. General frameworks and some fundamental issues for the study of NCSs are proposed. A significant emphasis has been on developing control methodologies to study the character of NCSs. This survey paper presents recent NCSs control methodologies, some promising research directions are also covered.

SuB3-b-5 **14:50-15:10**

The Modeling and Parameters Identification for IGBT Based on Optimization and Simulation

Yanxia Gao, Nan Li, Shuibao Guo, Haijian Liu
Shanghai University, China

IGBT (Insulated Gate Bipolar Transistor) is becoming more and more popular in many power applications, since it offers a good compromise between on-state loss, switching loss and easy of use. To develop circuits and systems with the devices, model and model parameters are necessary in circuit simulations. This paper presents a procedure for identifying the most important model parameters of IGBT. As an example, the results of identification for BUP302 are given.

SuB3-b-6 **15:10-15:30**

Neural Network Prediction-based Deadband Feedback Scheduler for Networked Control Systems

Xianming Tang, Jinshou Yu
East China University of Science and Technology, China

The major problem that networked control systems (NCSs) encounter in practical application is the random time-varying characteristics of flexible network workload. A novel feedback scheduler which based on neural networks and online adjustable deadbands is suggested. Deadband control is explored as a solution to reduce network traffic in NCSs according to the available network resources. To predict online the variation of workload, a BP feedforward neural network is adopted. Simulation results show that this new approach can alleviate the influence of workload variation to the greatest extent and improve the Quality of Control (QoC) of networked control systems.

SuB3-c **15:50-18:10**
Room3
Topic: Intelligent modeling, monitoring, and control of complex nonlinear systems-3

SuB3-c-1 **15:50-16:10**

Optimization Based on Symbiotic Multi-Species Coevolution Model

Hanning Chen1,2, Yunlong Zhu1, Kunyuan Hu1, Dingyi Zhang1,2, Ben Niu1,2
1.Shenyang Institute of Automation, CAS, China
2.Chinese Academy of Sciences, China

This paper presents a general model for the coevolution of symbiotic species. Species extinction and speciation are also considered in this model to tie it closer to natural evolution, as well as improve optimization strategy. This model is instantiated as a novel optimization algorithm—SMSO, symbiotic multi-species optimizer. The SMSO algorithm extends the dynamics of the canonical PSO algorithm by adding a significant ingredient, which takes into account the symbiotic coevolution between species. When tested in the domain of function optimization, the SMSO algorithm markedly outperforms the canonical PSO algorithm in terms of accuracy and convergence speed on all benchmark functions.

SuB3-c-2 **16:10:16:30**

Enhanced Simulated Annealing Algorithm With Multi-Constraint and Its Application On Nonlinear Optimization

Kunxia Wang1, Jinhui Wang2, Runmei Zhang1
1.AnHui Institute of Architecture and Industry, China
2.University of Science and Technology of China, China

An improved simulated annealing algorithm, called Enhanced Simulated Annealing Algorithm (ESA), is presented. ESA adopts the Cauchy distribute perturbation at the early stage of particle cooling, which is advantageous to the global search. At the later stage of cooling, the Uniform distribute perturbation with variable step length technique is adopted so that large-scale jump can be avoided. Experimental result on standard test functions implies that ESA, compared with other algorithms, is effective and robust, and that ESA is suitable for function optimization, especially complicated target functions with multi-constraint.

SuB3-c-3 **16:30-16:50**

Chaos Synchronization of Coupled Neurons under External Electrical Stimulation Using Adaptive H^{∞} Control

Yan-Qiu Che, Jiang Wang, Si-Si Zhou, Bin Deng
Tianjin University, China

In this paper, the H_{∞} control via an adaptive neural network approach is proposed to realize the synchronization of two gap junction coupled chaotic FitzHugh-Nagumo (FHN) neurons under external electrical stimulation. The control scheme is robust to the uncertainties such as unmodeled dynamics, ionic channel noise and external disturbances. Asymptotic chaos synchronization are obtained by proper choice of the control parameters. The simulation results demonstrate the effectiveness of the proposed control method.

SuB3-c-4 **16:50-17:10**

A novel fault diagnosis of analog circuit algorithm based on incomplete wavelet packet transform and

improved balanced binary-tree SVMs

Anna Wang1, Junfang Liu1, Hao Wang2, Ran Tao3
1.Northeastern University, China
2.China University of Mining & Technology, China
3.Northeast Yucai School, China

Aiming at to the characteristics of fault diagnosis of analog circuit with tolerances, noise, circuit nonlinearities and small sample set, this paper presents a novel algorithm for the existent problems based on incomplete wavelet packet transform for feature extraction and improved balanced binary-tree support vector machines (BBSVMs) for multi-classification. Firstly, analyzing characters of the optimal wavelet packet transform and the incomplete wavelet packet transform, the conclusion that the latter is perfect for fault diagnosis of analog circuit is obtained. Secondly, in order to perform multi-class classification, binary-tree-based SVMs has been studied. By introducing the separability measure that based on the space distribution of pattern classes, an improved balanced binary-tree structure is constructed. The proposed algorithm for analog circuits with tolerances and noise is implemented, and simulation results show us that compared with several existent fault diagnosis methods, the current algorithm has highest classification speed and higher classification accuracy, which make fault diagnosis of analogy circuit on-line promising.

SuB3-c-5 **17:10-17:30**

Study on Signal Interpretation of GPR Based on Support Vector Machines

Huasheng Zou1,2, Feng Yang1
1.China University of Mining and Technology, China
2.Wenzhou University, China

In the process of the roadbed disease recognition, as a result of the complexity and immaturity of the roadbed medium, the ground penetrating radar signal explanation has multi-solutions. It affects the application of ground penetrating radar and the roadbed disease detection. The support vector machines is one algorithm based on the structural risk minimization principle, it can obtain the overall optimal solution in sample less situations. It has solved the inevitable partial minimum problem and overcome the disadvantage, which the traditional neural network cannot avoid. In this paper the ground penetrating radar signal explanation model is established and applied in recognition to the roadbed disease using the support vector machine theory and methods. The result has proved that this method may enhance ground penetrating radar signal explanation precision and efficiency.

SuB3-c-6 **17:30-17:50**

Global synchronization of Ghostburster neurons via active control

Jiang Wang, Lisong Chen, Bin Deng, Feng Dong
Tianjin University, China

In this paper, active control law is derived and applied to control and synchronize two unidirectional coupled Ghostbursters neurons under external electrical stimulation. Firstly, the dynamical behavior of the nonlinear Ghostburster model responding to various external electrical stimulations is studied. Then, using the results of the analysis, the active control strategy is designed for global synchronization of the two unidirectional coupled neurons and stabilizing the chaotic bursting trajectory of the slave system to desired tonic firing of the master system. Numerical simulations demonstrate the validity and feasibility of the proposed method.

SuB3-c-7 **17:50-18:10**

Intelligent Knowledge Capsule Design for the Multi Functional Aspects

JeongYon Shim
Kangnam University, Korea

Every Intelligent technique has its strong and weak point and its appropriate application area is di_erent. For making more intelligent system, sometimes it needs to assemble the di_erent technology. On this purpose, Intelligent Knowledge Capsule assembling connective learning of neural network and logical conceptual learning was developed for multiple aspects in this paper. Focusing on the structural memory and knowledge retrieval We apply this mechanism to virtual memory and test the retrieving process.

SuB2-a **8:30-10:10**
Room4
Topic: Fuzzy, neural, fuzzy-neuro hybrids and application-1

SuB2-a-1 **8:30-8:50**

Real Time Object Recognition using K-Nearest Neighbor in Parametric Eigenspace

MyungA Kang1, JongMin Kim2
1.KwangJu University, Korea
2.Chosun University, Korea

Object recognition technologies using PCA(principal component analysis) recognize objects by deciding representative features of objects in the model image, extracting feature vectors from objects in a image and measuring the distance between them and object representation. Given frequent recognition problems associated with the use of point-to-point distance approach, this study adopted the k-nearest neighbor technique(class-to-class) in which a group of object models of the same class is used as recognition unit for the images inputted on a continual input image. However, the robustness of recognition strategies using PCA depends on several factors, including illumination. When scene constancy is not secured due to varying illumination conditions, the learning performance the feature detector can be compromised, undermining the recognition quality. This paper proposes a new PCA recognition in which database of objects can be detected under different illuminations between input images and the model images.

SuB2-a-2 **8:50-9:10**

Optimal Design of TS Fuzzy Control System Based on DNA-GA and Its Application

Guangning Xu, Jinshou Yu
East China University of Science and Technology, China

A TS fuzzy model modeling method is presented in this paper. The input parameters of the TS fuzzy model are identified via fuzzy c-means clustering method and the output parameters are optimized via DNA genetic algorithm. Finally, the proposed method is applied to build the soft sensing model for the yield of acrylonitrile. Examining results demonstrate the effectiveness of this method.

SuB2-a-3 **9:10-9:30**

Grey Theory Based Fuzzy Predictive Control

Lisheng Wei1, Minrui Fei1, Huosheng Hu2
1.Shanghai University, China
2.University of Essex, UK

In this paper, a novel fuzzy predictive control method based on the research of grey theory is proposed. The grey predictive structure is used to obtain more important information from sensor. And the on-line rule switching mechanism is constructed to provide an appropriate predictive step size in order to improve the control performance. By using this method, the random characteristic of some non-stationary time series from the sensors can be reduced, and the whole system's performance is improved. The overall mathematical model of this method is established. When the input fuzzy sets are big enough, we derive the sufficient condition for convergence of the proposed control algorithm. At last, experiments on a plant show the proposed method not only improves its precision, but also guarantees the robustness.

SuB2-a-4 **9:30-9:50**

A Fuzzy Variable Weight Model for Moldability Evaluation in Injection Molding

Jin Cheng, Jian R. Tan, Yi X. Feng
Zhejiang University, China

This paper proposes a fuzzy variable weight decision-making approach to deal with the optimization problem of mold design and process parameter setting in plastic injection molding. Linguistic variables expressed in triangular fuzzy numbers are used to rate the defects chosen as criteria for moldability evaluation due to the fact that the molding performance of an alternative is usually evaluated from the seriousness of defects in injection-molded plastic product, which can hardly be described in crisp variables. After the initial weight of every criterion is assigned and the seriousness of predicted defects is rated according to the results of flow analysis, the varied weight of every criterion can be calculated with the variable weight profit vector. With the Technique for Order Performance by Similarity to Ideal Solution (TOPSIS), a molding performance index is defined to determine the ranking order of all alternatives by calculating the distances to the fuzzy serious ideal solution and fuzzy slight ideal solution simultaneously. Finally, the veracity and feasibility of our variable weight model for moldability evaluation is demonstrated through an example of selecting the best gate location. The experimental results show that the proposed model is superior to the constant weight one for moldability evaluation since it objectively reflects the dynamical fuzzy decision-making logic of experts.

SuB2-a-5 **9:50-10:10**

On the Problem of Group Decision Making Based on Intuitionistic Fuzzy Judgment Matrices

Zaiwu Gong
Nanjing University of Information Science and Technology, China

The problem of group decision making based on intuitionistic fuzzy judgment matrix is investigated. Approaches to intuitionistic fuzzy group decision making are proposed from three different preference views. Using the operations of intuitionistic fuzzy values, the ranking method of intuitionistic fuzzy judgment matrix is given. It is illustrated by a numerical example that the approaches proposed are in accord with the rules of group decision making.

SuB2-b **10:30-12:10**
Room4
Topic: Fuzzy, neural, fuzzy-neuro hybrids and application-2

SuB2-b-1 **10:30-10:50**

A Methodology Using Fuzzy Logic for Estimating the Length of a Cane

DaeJin Jang, HyunSeok Yang
Yonsei University, Korea

Canes traditionally have been used for balance. However, canes recently are also being required for bearing weight. Researchers have reported that a number of the elderly use canes which are not the correct length for them, placing them at risk of falling. There are two methods commonly used in clinics for determining appropriate cane length: the distance from the greater trochanter to the ground, and the distance from the wrist crease to the ground. A different method is applied to estimating the length of a cane according to researchers because the conditions of the elderly are limited to simplified experiments on the elderly. Fuzzy logic is an appropriate method to evaluated complicated factors of the elderly. Linguistic rules and knowledge-based rules need to be employed to evaluate applicability of human knowledge to the length of a cane. To estimate the proper length of a cane, multiple factors (Age, Physical strength, Purpose, Disease) are considered. These factors include both quantitative and qualitative measures. Qualitative measures are converted to numerical measures using fuzzy logic.

SuB2-b-2 **10:50-11:10**

The Modified Self-organizing Fuzzy Neural Network Model for Adaptability Evaluation

Zuohua Miao1, Hong Xu1, Xianhua Wang2
1.Wuhan University of Science and Technology, hina
2.China University of Geosciences, China

The author proposed a novel approach for evolving the architecture of a multi-layer neural network based on neural network and fuzzy logic technologies. The model is

front-network which comprised with five layers architecture which composed of dynamic inference of fuzzy rules where the consequent sub-models are implemented by recurrent neural networks with internal feedback paths and dynamic neuron synapses. An optimal learning scheme with the evaluation guide line which error data embed is applied for training of LF-DFNN models. The results of experiment demonstrate that new model have superior performance.

SuB2-b-3 **11:10-11:30**

A Fuzzy Mapping from Image Texture to Affective Thesaurus

Haifang Li, Jin Li, Jiancheng Song, Junjie Chen
Taiyuan University of Technology, China

Most of the image analysis methods focus on affective information by using color. In this paper a new indexing scheme, called FRD (Fuzzy Recognize Degree)-Clustering is proposed for affection-assisted semantic image analysis on the basis of the texture feature. A set of perceptual relevant features, used for indexing is hence introduced: directionality, contrast and coarseness. This FRD scheme allows us to retrieve images based on high-level affective concepts. Experiments with images of the nature and landscape domain demonstrate the performance of the proposed approach.

SuB2-b-4 **11:30-11:50**

A Fish School Clustering Algorithm: Applied to Student Sectioning Problem

Mahmood Amintoosi1,2, Mahmoud Fathy1, Naser Mozayani1, Adel T. Rahmani1
1.Iran University of Science and Technology, IRAN
2.Tarbiat Moallem University of Sabzevar, IRAN

In this paper a new clustering algorithm based on the fish school behavior is proposed. The algorithm is an extension of the classical flock model of Reynolds with a new characteristic. We have different kinds of fishes: leader fish and follower fish. In addition it is supposed that our artificial fishes live in some predefined caves. The school is a set of groups, which every group has a leader and lie in a cave in every time. Other members of the group are leader followers. Regarding the concepts of joining and splitting of the groups, a clustering algorithm which is almost similar to hierarchical clustering algorithms is proposed. The proposed algorithm is applied to student sectioning problem, a sub problem of timetabling problem. Simulation results show the applicability of the proposed algorithm.

SuB2-b-5 **11:50-12:10**

Improving Female Breast Cancer Prognosis by Means of Fuzzy Rule Induction with Artificial Immune Systems

Filippo Menolascina1,2, Roberto T. Alves3, Stefania Tommasi1, Patrizia Chiarappa1, Myriam Delgado3, Vitoantonio Bevilacqua2, Giuseppe Mastronardi2, Alex A. Freitas4, Angelo Paradiso1
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2.Polytechnic of Bari, Italy
3.Federal Technological University of Paranà – UTFPR, Brazil
4.University of Kent, UK

Breast cancer is the second most common cause of deaths from cancer among women in the United States. Even if significant steps have been made in the field of cancer treatment there's still room for investigation when it comes to the modeling of metastatic behavior of tumors. In particular over-treatment avoidance of patient is currently a challenging area of research due to the positive effects it can have patients' quality of life and clinical costs management. In this paper we propose a novel approach to gene signature finding aimed at improving prediction accuracy of the tumor recurrence. Our approach lays on a novel computational paradigm, namely Artificial Immune Systems (AIS). Based on AIS, our algorithm, IFRAIS (Induction of Fuzzy Rules with Artificial Immune Systems) mines the high density array data in order to extract useful knowledge, in the form of "IF-THEN" rules, easily interpretable by physicians and able to improve prediction accuracy for tumor recurrence.

SuB4-a **13:30-15:30**
Room4
Topic: Ant colonies and particle swarm optimization and application-1

SuB4-a-1 **13:30-13:50**

A novel ecological particle swarm optimization algorithm and its population dynamics analysis

Qi Kang1, Lei Wang1, Qi-di Wu1,2
1.Tongji University, China
2.China Ministry of Education of China, China

This paper introduces a novel particle swarm optimization algorithm from the original idea of ecological population evolution. Initially, ecological population competition model (EPCM) is presented. From the basis of EPCM, a novel ecological particle swarm optimization (EPSO) algorithm and its general framework are proposed, in which a particle swarm system with ecological hierarchy and competition model is defined and two collocating strategies of inertia weight factor are considered. The convergence performance and population dynamics including population aggregation and population diversity of the proposed approach are discussed separately through empirical simulations with well-known benchmarks from the standard literature.

SuB4-a-2 **13:50:14:10**

Stability Analysis of Double Integrator Swarm Model Relation with Position and Velocity

Dan Jin, Lixin Gao
Wenzhou University, China

In this paper, we propose a biologically inspired, continuous double integrator model based on individual Newton's law in an n-dimensional space. The double integrator model has relation with positions and velocities of individuals. We discuss three cases of the attraction repulsion functions which are odd for the attractive force and repulsional force taking effect in opposite directions,

and we get the swarm size and ultimate motions while cohesion for every case. Stability analysis and numerical simulations are also presented to demonstrate the effectiveness of our model.

SuB4-a-3 **14:10:14:30**

Particle Swarm Optimization with FUSS and RWS for High Dimensional Functions

Zhihua Cui1,2, Xingjuan Cai2, Jianchao Zeng2, Guoji Sun1
1.Xi'an Jiaotong University, China
2.Taiyuan University of Science and Technology, China

This paper proposes a novel variant of particle swarm optimization (PSO) to provide a balance between convergence speed and premature convergence. First, the fitness uniform selection strategy (FUSS) original designed for evolutionary algorithm is incorporated in the standard PSO. Second, a "random walk strategy" (RWS) is designed to further enhance the ability to escaping from a local optimum. Four different variants are used to illustrate this strategy. Finally, the proposed PSO combined with FUSS and RWS is applied to seven famous high dimensional benchmarks while the dimensionality is from 50 up to 3000. Simulation results demonstrate good performance of the new method in solving high dimensional multi-modal problems when compared with two other variants of the PSO.

SuB4-a-4 **14:30-14:50**

An Improved Genetic-Based Particle Swarm Optimization for Job Shop Scheduling with Fuzzy Processing Time

Qun Niu1,3,4, Bing Jiao2, Xingsheng Gu1
1.East China University of Science & Technology, China
2.Shanghai DianJi University, China
3.Shanghai University, China
4.Shanghai Key Laboratory of Power Station Automation Technology, China

Considering the uncertainty of the processing time in practical production, job shop scheduling model with fuzzy processing time is established. The objective is to find a sequence that minimizes the makespan and the uncertainty of the makespan by using an approach for ranking fuzzy numbers. The particle swarm optimization (PSO) is a population-based optimization technique that has been applied to a wide range of problems, but there is few literatures reported in respect of application to scheduling problems because of its unsuitability for them. In this paper, PSO is redefined and modified by introducing genetic operations such as crossover and mutation to update the particles, which is called GPSO and successfully employed to solve the formulated problem. Ten benchmarks with fuzzy processing time are used to test GPSO. The comparative simulation results with genetic algorithm show the feasibility and effectiveness of the proposed method.

SuB4-a-5 **14:50-15:10**

A Novel Quantum Ant Colony Optimization Algorithm and Its Application to Fault Diagnosis

Ling Wang1,2, Qun Niu1,2, Minrui Fei1,2
1.Shanghai Key Laboratory of Power Station Automation Technology, China
2.Shanghai University, China

Considering the absence of the fault data in the real chemical production process, Support Vector Machines (SVMs) which fits the small sample problem is adopted to diagnose the chemical process faults. To eliminate the disturbances from the high dimensional data as well as system noises for enhancing the fault diagnosis ability of SVMs, a novel quantum ant colony optimization (QACO) algorithm is proposed and combined with SVMs to select the fault features. The benchmark optimization function tests demonstrate that the proposed QACO is valid and effective. The results of fault diagnosis on Tennessee Eastman Process (TEP) prove that the feature selection method based on QACO and SVMs can find the essential fault variables exactly, and greatly improve the fault diagnosis performance of SVMs in terms of the correct rates, the real-time ability and robustness in the complex chemical process.

SuB4-a-6 **15:10-15:30**

A Diversity-Guided Particle Swarm Optimizer for Dynamic Environments

Jing Hu, Jianchao Zeng, Ying Tan
Taiyuan University of Science and Technology, China

For many real-world changeable problems over time, the goal of optimization is not only to acquire an optimal solution, but also to track its progression through the search space as closely as possible. In this paper, an improved detection technique at the particle level is designed. Then, a new method of response, learning from the changing global optimum for new environments guided by population diversity, is designed. It defines response condition as well as part of particles to be reset and flying direction after a change. Then, the parabolic benchmark functions with various severities are used to test, compared with the Eberhart-PSO and APSO, and the results show the modified strategies are effective in tracking changes.

SuB6 **15:50-18:10**
Room4
Topic: Biomedical signal processing, imaging and visualization

SuB6-1 **15:50-16:10**

An Improved Denoising Algorithm for ECG Signal by Nonlinear Lowpass Filter

Fengqin Yu, Shukai Fan, Zhi Xiao
Jiangnan University University, China

The Electrocardiograph (ECG) signal contains various valuable medical information. However, in the course of ECG signal data Acquisition System, the waveform is affected by lots of physiological parameters, as well as the recording artifacts such as 50Hz power line interference, motion artifacts and additive broadband noise motion artifacts, which often make it difficult to identify the characteristics of ECG signals to some degree by using

conventional identification methods. In this paper, firstly, we use trap filter of 50 Hz to eliminate power interference. In addition, motion artifacts are removed by employing the cross-correlation detection method. Then restore the ECG signal peaks to their full amplitude by adding an endpoint detection method based on modified Teager energy measurement. After applying this preprocessed denoising procedure to the ECG signal, various interferences can be efficiently restricted. This procedure can also provide ideal waveforms for the real-time and exact characteristic identification of ECG signals. Therefore, the proposed scheme paves the way for the further reliable analysis of ECG signal, such as the exacting of the information about the heart rate variability (HRV) , the pattern classification and the recognition. The algorithm is tested using MIT/BIH arrhythmia database and proved to have satisfactory results.

SuB6-2 **16:10:16:30**

A Simplified GLRAM Algorithm for Face Recognition

Chong Lu1, Wanquan Liu2, Senjian An2
1.Yili Normal College, China
2.Curtin University of Technology, Australia

In this paper we propose a new face recognition method based on the generalized low rank approximations of matrices (GLRAM). First, we investigate the GLRAM and the associated coupled subspace analysis and then propose a new algorithm, which is named as SGLAM, to derive the projection matrices for GLRAM. We implement all these algorithms for face recognition on the ORL and YaleB databases and the experiments show that the SGLRAM produces comparable high performance compared to the 2DPCA and GLRAM. However, it costs much less time than GLRAM in training and save more space than the 2DPCA in testing.

SuB6-3 **16:30-16:50**

Robust Orientation Diffusion via PCA Method and Application to Image Super-resolution Reconstruction

Liang Xiao, Zhihui Wei, Huizhong Wu
Nanjing University of Science and Technology, China

An efficient method with systems of nonlinear partial difference equations (PDE) for image super-resolution was presented, in which geometric edge orientation estimated by the principle component analysis (PCA) method. Using the local and contextual discontinuity of image pixel's neighborhood, the robust orientation diffusion processes were exploited to enhance the sharpness of edges without incurring any additional artifacts. We also discuss the connection between the new PDE framework and the classical variational PDE method. Furthermore, the implementation scheme of the proposed approach was given by a novel finite difference method. Simulation results show that the proposed approach exhibited better performance than the standard linear interpolation and classical PDE approaches, particularly in the edge regions.

SuB6-4 **16:50-17:10**

Segmentation of Lymphoma Pathology Images Based on the HSV Color Space

Binghan Liu1, Yuhong Liu2, Yanjun Zeng2, Weizhi Wang3
1.Fuzhou University, China
2.Mechanics Institute ,Montanuniversity Leoben, Austria
3.Beijing University of Technology, China

Based on the HSV color space a method is presented to automatically segment lymphoma pathology images(LPI). According to the distribution rule of lymphoma pathology tissues in the HSV color space and the maximal class variance principle, a model which can segment lymphoma pathology images was built up. It can automatically separate different tissues in LPI, namely nuclear, cytoplasm , ground cytoplasm, lacuna and erythrocytes. The experimental results demonstrated that the segmentation accuracy of LPI reached 87% , which suggested that such method could segment the LPI more effectively with high speed.

SuB6-5 **17:10-17:30**

Contented-based Satellite Cloud Image Processing and Information Retrieval

Yanling Hao, Wei ShangGuan, Yi Zhu, Yanhong Tang
Harbin Engineering University Harbin, China

Satellite cloud image is a kind of useful image which includes abundant information, for acquired this information, the image processing and character extraction method adapt to satellite cloud image has to be used. Content-based satellite cloud image processing and information retrieval (CBIPIR) is a very important problem in image processing and analysis field. The basic character, like color, texture, edge and shape was extracted from the cloud image, and then the satellite cloud image database was provided to store the basic character information. Since traditional image retrieval method has some limitation, for realized image retrieval accurately and quickly, the CBIR method is adaptive. On the basis of the key technology of CBIPIR was studied, we could obtain the better retrieval effect, and the image retrieval result was shown in detail. The experiment result proves that the research and application of content-based satellite cloud image processing is valuable, which could improve the professional image application efficiency more.

SuB6-6 **17:30-17:50**

Biology Inspired Robot Behavior Selection Mechanism: Using Genetic Algorithm

Yiping Wang, Sheng Li, Qingwei Chen, Weili Hu
Nanjing University of Science & Technology, China

Since behavior selection is a crucial issue not only in biology, but also in robotics, especially in behavior-based robotics, it is nature to consider the behavior selection problem both in biological view and robotic view. In recent years, accumulative evidences from neurobiology and anatomy have given rise to proposals that the basal ganglia-a group of subcortex nuclei in vertebrate brains-serve as a central selection mechanism. This paper introduces a robot behavior selection mechanism inspired by basal ganglia and makes explorations of applying genetic algorithm to the optimization of model parameters. The proposed method demonstrates its efficiency through a simulated robot foraging task and casts light on

designing more intelligent and fluent behavior selection mechanism in the future.

SuB6-7 **17:50-18:10**

A New Image Auto-Segmentation Algorithm Based on PCNN

Zhihong Zhang1, Guangsheng Ma1, Zhijiang Zhao2
1.Harbin Engineering University, China
2.Harbin Engineering University, China

Pulse Coupled Neural Networks (PCNN) is applied to image segmentation efficiently. Although the segmentation result with classical PCNN depends on the suitable concerned parameters, many experiments have shown that the segmentation result changed periodically with the calculation cyclic iteration times, N, after other parameters had been set. Therefore, how to decide the best iteration times N, is the key of applying PCNN to automated image segmentation. This paper brought forward a new edge-statistic algorithm based on calculation of connected regions, in order to automatically get the optimized value of N. An Edge-pixel Criterion was raised, and with it the algorithm calculated the valid edge pixels during the iteration process, and it meant that the maximum edge pixels were accordant with the best iteration times N, thereby the best segmentation result was achieved. The experiments show that the improved PCNN algorithm can promote the segmentation ability and has much better sensitivity than those methods based on image entropy or edge operator, and also has much stronger robustness of image noisy.

Poster Session 1
9:10 – 10:10

PSuA-01

Internet Living Broadcast of Medical Video Stream

Shejiao Li, Bo Li, Fan Zhang
Henan University, China
Tianjin University, China

DirectShow based network living broadcast scheme of MPEG-4 medical video stream is presented. In this scheme, Digital Subtraction Angiography (DSA) video stream are captured by an advanced image capture board. MPEG-4 and DirectShow framework technique are used for data's compression and transmission. Data of DSA video stream can be transported easily from server sender Filter to client receiver Filter according to TCP and UDP protocols. Experimental results show that the image is clear in 100M LAN, and the delay is less than one second. High performances of definition and real-time of the DSA video are both achieved in this scheme.

PSuA-02

The Mechanical Properties of Bone Tissue Engineering Scaffold Fabricating via Selective Laser Sintering

Liulan Lin, Aili Tong, Huicun Zhang, Qingxi Hu, Minglun Fang
Shanghai University, China

Performance of bone tissue depends on porous scaffold microstructures with specific porosity characteristics that influence the behavior of the ingrown cells. The mechanical properties of porous tissue scaffolds are important for their biomechanical tissue engineering application. In this study, the composite materials powder was developed for the selective laser sintering process, and the parameters of selective laser sintering were optimized. With the aim of evaluating the influence of porosity on mechanical properties, we have studied the load limits for three specimens of scaffolds which have different porosity. Young's modulus was computed by determining the slope of the stress - strain curve along the elastic portion of the deformation. In addition, the final element analysis (FEA) module of UG NX4 was used to analyze these scaffolds. The results showed that the bone tissue engineering scaffolds were fabricated by SLS technology have good mechanical properties, which have good potential for tissue engineering applications.

PSuA-03

Feature Extraction for Mass Spectrometry Data

Yihui Liu
Shandong Institute of Light Industry, China

Mass spectrometry is being used to generate protein profiles from human serum, and proteomic data obtained from mass spectrometry have attracted great interest for the detection of early-stage cancer. However, high dimensional mass spectrometry data cause considerable challenges. In this paper a set of wavelet detail coefficients at different levels is used to characterize the localized changes of mass spectrometry data and reduce dimensionality of mass spectra. The experiments are performed on high resolution ovarian dataset. A highly competitive accuracy compared to the best performance of other kinds of classification models is achieved.

PSuA-04

Constructing Structural Alignment of RNA Sequences by Detecting and Assessing Conserved Stems

Xiaoyong Fang1, Zhigang Luo1, Bo Yuan2, Zhenghua Wang1, Fan Ding1
1.National University of Defense Technology, China
2.Ohio State University, USA

The comparative methods for predicting RNA secondary structure can be facilitated by taking structural alignments of homologous sequences as input. However, it is very difficult to construct a well structural alignment of RNA sequences without knowing the secondary structures. In this paper, we present a stem-based method for constructing structural alignment of RNA sequences with unknown structures. The method can be summarized by: 1) we detect possible stems in the RNA sequence using the so-called position matrix with which some possibly paired positions are uncovered; 2) we detect conserved stems across multiple sequences by multiplying the position matrices; 3) we assess the conserved stems using the *Signal-to-Noise* and the new SCFG model; 4) we construct structural alignment of RNA sequences by incorporating conserved stems with Clustal W which is a popular program for multiple sequence alignment. We tested our

method on data sets composed of known structural alignments which are downloaded from the Rfam database. The accuracy, measured as *sensitivity* and *true positive rate*, of our method is much greater than alignments by Clustal W.

PSuA-05

Iris Verification using Wavelet Moments and Neural Network

Zhiqiang Ma1, Miao Qi1,2, Haifeng Kang1,2, Shuhua Wang1,2, Jun Kong1,2
1.Northeast Normal University, China
2.Key Laboratory for Applied Statistics of MOE, China

In this paper, a novel and robust verification approach using iris features is presented. Contrasting with conventional approaches, only two iris sub-regions instead of entire iris, where are nearly not occluded by useless parts such as eyelash and eyelid, are segmented for verification. Gabor filtering and wavelet moments methods are used to extract the iris texture features. In the verification stage, the principal component analysis (PCA) technique and one-class-one-network (Back-Propagation Neural Network (BPNN)) classification structure are employed for dimensionality reduction and classification, respectively. The experimental results show that the correct verification rate can reach 98.65% using our proposed approach.

PSuA-06

Improved Locally Linear Embedding by Cognitive Geometry

Guihua Wen1, Lijun Jiang1, Jun Wen2
1.South China University of Technology, China
2.Hubei Insitute for Nationalities, China

Locally linear embedding heavily depends on whether the neighborhood graph represents the underlying geometry structure of the data manifolds. Inspired from the cognitive relativity, this paper proposes a relative transformation that can be applied to build the relative space from the original space of data. In relative space, the noise and outliers will become further away from the normal points, while the near points will become relative closer. Accordingly we determine the neighborhood in the relative space for Hessian locally linear embedding, while the embedding is still performed in the original space. The conducted experiments on both synthetic and real data sets validate the approach.

PSuA-07

A Multiagent Quantum Evolutionary Algorithm for Global Numerical Optimization

Chaoyong Qin, Jianguo Zheng, Jiyu Lai
Donghua University, China

In this paper, a novel kind of algorithm, multiagent quantum evolutionary algorithm(MAQEA), is proposed based on multiagent, evolutionary programming and quantum computation. An agent represents a candidate solution for optimization problem. All agents are presented by quantum chromosome, whose core lies on the concept and principles of quantum computing, live in table environment. Each agent competes and cooperates with its neighbors in order to increase its competitive ability. Quantum computation mechanics is employed to accelerate evolution process. The result of experiments shows that MAQEA has a strong ability of global optimization and high convergence speed.

PSuA-08

Developing and optimizing a finite element model of phalange using CT images

Qingxi Hu, Quan Zhang, Yuan Yao
Shanghai University, China

It is very important to construct the three-dimensional finite element (FE) model of the human skeleton for research on the mechanism of skeleton blunt-impact injury and on the assessment of injury severity. A feasible and efficient method of the skeleton finite element modeling using CT images was proposed in the paper. There are many problems during the FEA processing of complex models such as distortions of the element, numerical divergence. Three methods of mesh optimization based on stereolithography (STL) were provided. According to the analysis on the complexity of the ANSYS processing and the precision of the result, the optimizing process of developing a finite element model of phalange was proposed. The described method can generate detailed and valid three dimensional finite element model of phalange with different inner constructions and complex geometry. This method is rapid and can readily be used for other medical applications.

PSuA-09

A Hybrid Approach to 3D Arm Motion Tracking

Yaqin Tao, Huosheng Hu
University of Essex, UK

This paper presents a hybrid approach to 3D arm motion tracking for a tele-rehabilitation program. A Particle Filter (PF) algorithm is adopted in the proposed system, to fuse data from inertial and visual sensors in a probabilistic manner. Multi-modal distributions of system states are propagated by PF based on a “factor sampling” technique. To avoid the problem of particle degeneracy in conventional PF algorithms, two strategies are adopted in our system, namely state space pruning, and an arm physical geometry constraint. Experimental results show that the proposed PF framework outperforms other fusion methods, and tracking results are accurate in comparison to the ground truth that is provided by a commercial marker-based motion tracking system.

PSuA-10

A Two-phase Chaotic Neural Network Algorithm for Channel Assignment in Cellular Systems

Tinggao Qin, Xiaojin Zhu, Yanchun Chen, Jian Wang
Shanghai University, China

In this paper, a new chaotic neural network algorithm for channel assignment in cellular networks is proposed as an optimization algorithm, and used in CAP. There are two phases in the new model. According to the difficulty measure of each cell, the first phase is executed to assign

channels cell by using the frequency exhaustive strategy. If the optimum assignment solution is not obtained in the first stage, another phase which generated by adding chaotic noise to each neuron of the Hopfield neural network (HNN) called DCN-HNN is taken, and the DCN-HNN stage is then applied to continue the channel assignment until the optimum assignment is made or a maximum number of iteration is reached. The Kunz benchmark test problem is also used to compare the performance of the new algorithm against other algorithms. Simulation results show that the new method has a higher searching ability and lower computing time in searching the global minimum.

PSuA-11

Modeling and Real-Time Scheduling of Semiconductor Manufacturing Line based on Simulation

Zhongjie Wang1, Xinhua Jiang2, Qidi Wu1
1.Tongji University, China
2.Huawei Technology Co. Ltd.

Due to the difficulties of establishing a model of semiconductor manufacturing line, a real-time scheduling system of semiconductor manufacturing line is established with discrete event simulation technique. By employing the object-oriented modeling method, this system is implemented by simulation. An actual system with 40 machines and 60 processing steps is employed to demonstrate the validity of this system. Experiments indicate that the modeling and real-time scheduling system is accurate and reliable.

PSuA-12

Robust Auto Tune Smith Predictor Controller Design for Plant with Large Delay

Huang Ziyuan1, Zhen Lanlan1, Fei Minrui2
1.Shanghai Electric Power College, China
2.Shanghai University, China

A robust Smith controller for plant with large delay is proposed. A nonlinear PD controller is design to auto tune on-line the parameters of robust controller such that the closed system is of robust stability as well as good dynamic performance. The simulation results show that the method can control the plant with large time-variable delay properly.

PSuA-13

Parameter Identification of Bilinear System Based on Genetic Algorithm

Zhelong Wang, Hong Gu
Dalian University of Technology, China

The paper presents a method for the identification of bilinear system parameters by using an improved Genetic Algorithm. Good results could still be obtained when the system output was influenced by Gaussian noise in the simulation. By comparing with RLS and COR through a simulation experiment to a SISO bilinear system, it is found that the method can get better result than the other two methods. Through a simulation experiment to a MIMO bilinear system, the method can get reasonably good results too. These simulations show that the method is simpler and can get better results than RLS and COR. Through a simulation study to an MIMO bilinear system, good results can still be got. In the last section, the paper describes that a hybrid GA, the combination of Genetic Algorithm and nonlinear Least Square, was developed to identify bilinear system structure and parameters simultaneously.

PSuA-14

Kernel-Based Online NEAT for Keepaway Soccer

Yun Zhao, Hua Cai, Qingwei Chen, Weili Hu
Nanjing University of Science and Technology, China

This paper presents a kernel-based online neuroevolutionary of augmenting topology (KO-NEAT) algorithm, which borrowing the selection mechanisms used in temporal difference (TD) algorithms and combining the kernel function approximator for individual fitness initiation. KO-NEAT can improve evolution's online performance of NEAT and learns more quickly. Empirical results in keepaway soccer problem demonstrate that KO-NEAT can substantially improve the original algorithm.

PSuA-15

Application of the Agamogenetic Algorithm to Solve the Traveling Salesman Problem

Yinghui Zhang, Zhiwei Wang, Qinghua Zeng, Haolei Yang, Zhihua Wang
Chengdu Neusoft Institute of Information, China

Based on the biologic agamogenesis mechanism, the agamogenetic algorithm (AGA), which is similar to classical genetic algorithms except the agamogenesis and highly converging speed, is presented to solve the optimization problems. In order to solve the traveling salesman problem (TSP) by AGA, one agamogenetic operator R-Edge and one mutation operator NI-Dot are given by introducing the conception of the relative distance between cities. The validity of the AGA to solve the traveling salesman problem is shown by simulative experiments.

PSuA-16

Simulation-Based Optimization Research on Outsourcing Procurement Cost

Jiangming Jia, Zhengxiao Wang, Xiaohong Pan
Zhejiang University, China

To solve the cost control problem of outsourcing procurement inherent in the complexness and difficulty for mathematical analysis, this paper established a simulation-based cost Optimization framework. Firstly, we adopted Poisson process to simulate multi-supplier outsourcing market environment, the procurement cost expectations objective function and constraints of the model was introduced. Secondly, taking decision strategy as feedback variables, procurement cost optimization model was proposed. Thirdly, several key technologies for algorithm implement were described. Finally, based on the history demand of an aircraft model factory, numerical simulation is carried out to show that this optimization model can effectively reduce the outsourcing procurement total cost and outsourcing parts inventory fluctuation.

PSuA-17

Fuzzy Neural Network-Based Adaptive Single Neuron Controller

Li Jia1, Pengye Tao1, MinSen Chiu2
1.Shanghai University, China
2.National University of Singapore, Singapore

To circumvent the drawbacks in nonlinear controller designing of chemical processes, an adaptive single neuron control scheme is proposed in this paper. A class of nonlinear processes is approximated by a fuzzy neural network-based model. The key of this work is, an adaptive single neuron controller, which mimics PID controller, is considered in the proposed control scheme. Applying this result and Lyapunov stability theory, a novel-updating algorithm to adjust the parameters of the single neuron controller is presented. Simulation results illustrate the effectiveness of the proposed adaptive single neuron control scheme.

PSuA-18

Adaptive Fuzzy Sliding Mode Control of the Model of Aneurysms of the Circle of Willis

Peijun Ju, Guocai Liu, Li Tian, Wei Zhang
Taishan University, China

An adaptive fuzzy sliding mode controller for highly nonlinear biological system is proposed by considering the model of aneurysms of the circle of willis. The fuzzy logic system approximates and adaptively cancels an unknown plant nonlinearity using the state variables. A control law and adaptive laws for unknown parameters and bounding constant are established so that the whole closed-loop system is stable in the sense of Lyapunov. This paper discussed the nonlinear dynamic behavior and control of blood speed in aneurysm. The simulation for the aneurysms model demonstrates that the proposed controller provide good tracking and estimation performances.

PSuA-19

Guaranteed Cost Robust Filter for Time Delayed T-S Fuzzy Systems with Uncertain Nonlinearities

Fan Zhou, Li Xie, Yaowu Chen
Zhejiang University, China

The problem of guaranteed cost robust fuzzy filtering design for a class of time delayed systems with uncertain nonlinearities have been investigated. The nonlinear uncertain time delayed system is represented by state-space Takagi-Sugeno fuzzy model. In terms of linear matrix inequalities (LMIs), the stability of the filter error systems are analyzed by basis-dependent Lyapunov function approach. Then the sufficient conditions for the existence of the fuzzy filter are given in the form of convex optimization. The optimal upper bound of the guaranteed cost value of the filtering error systems can be solved when the LMIs are feasible.

PSuA-20

Colony Algorithm for Wireless Sensor Networks Adaptive Data Aggregation Routing Schema

Ning Ye1,2, Jie Shao4, Ruchuan Wang2,3, Zhili Wang1
1.Nanjing College for Population Programme Management, China
2.NJUPT, China
3.Nanjing University, China
4.Nanjing University of Aeronautics & Astronautics, China

Wireless sensor network should decrease the power costs of redundancy information and delay time. The technology of data aggregation can be adopted. A routing algorithm for data aggregation based on ant colony algorithm (ACAR) is presented. The main idea of this algorithm is optimization of data aggregation route by some cooperation agents called ants using the three heuristic factors about energy, distant and aggregation gain. For realizing data aggregation by positive feedback of the ants, the nodes of wireless sensor networks should not maintain the global information. The algorithm is a distributed routing algorithm and realizes data aggregation trade-off in energy and delay. The analysis and the experimental results show that the algorithm is efficient.

PSuA-21

Research on Coaxiality Errors Evaluation Based on Ant Colony Optimization Algorithm

Ke Zhang
Shanghai Institute of Technology, China

Based on the analysis of existent evaluation methods for coaxiality errors, an intelligent evaluation method is provided in this paper. The evolutional optimum model and the calculation process are introduced in detail. According to characteristics of coaxiality error evaluation, ant colony optimization (ACO) algorithm is proposed to evaluate the minimum zone error. Compared with conventional optimum evaluation methods such as simplex search and Powell method, it can find the global optimal solution, and the precision of calculating result is very good. Then, the objective function calculation approaches for using the ACO algorithm to evaluate minimum zone error are formulated. Finally, the control experiment results evaluated by different method such as the least square, simplex search, Powell optimum methods and GA, indicate that the proposed method does provide better accuracy on coaxiality error evaluation, and it has fast convergent speed as well as using computer expediently and popularizing application easily.

PSuA-22

A Memetic Algorithm with Genetic Particle Swarm Optimization and Neural Network for Maximum Cut Problems

Jiahai Wang
Sun Yat-sen University, China

In this paper, we incorporate a chaotic discrete Hopfield neural network (CDHNN), as a local search scheme, into a genetic particle swarm optimization (GPSO) and develop a memetic algorithm GPSO-CDHNN for the maximum cut problem. The proposed algorithm not only performs exploration by using the population-based evolutionary search ability of the GPSO, but also performs exploitation by using the CDHNN. Simulation results show that the

proposed algorithm has superior ability for maximum cut problems.

PSuA-23

A Novel Neural Network Based Reinforcement Learning

Jian Fan1,2, Yang Song1, MinRui Fei1, Qijie Zhao1
1.Shanghai University, China
2.Nanjing Army Command College, China

Many function-approaching methods such as neural network, fuzzy method are used in reinforcement learning methods for solving its huge problem space dimensions. This paper presents a novel ART2 neural network based reinforcement learning method (ART2-RL) to solve the space problem. Because of its adaptive resonance characteristic, ART2 neural network is used to process the space measurement of reinforcement learning and improve the learning speed. This paper also gives the reinforcement learning algorithm based on ART2. A simulation of path planning of mobile robot has been developed to prove the validity of ART2-RL. As the complexity of the simulation increased, the result shows that the number of collision between robot and obstacles is effectively decreased; the novel neural network model provides significant improvement in the space measurement of reinforcement learning.

PSuA-24

Prediction of Death Rate of Breast Cancer Induced from Average Microelement Absorption with Neural Network

Shouju Li1, Jizhe Wang1,2, Yingxi Liu1, Xiuzhen Sun2
1.Dalian University of Technology, China
2.Dalian Medical University, China

Breast cancer is one of the leading causes of deaths from cancer for the female population in both developed and developing countries. The average microelement absorption can affect death rate of breast cancer. Artificial neural networks have been successfully applied to problems in the prediction of death rate of breast cancer induced from average microelement absorption. To predict the death rate of breast cancer induced from average microelement absorption using artificial neural network is feasible and a well trained artificial neural network by Levenberg-Marquardt algorithm reveals an extremely fast convergence and a high degree of accuracy. The investigation demonstrates that the proposed training and forecasting procedure is almost 100 times faster than that of classical BP algorithm and poses higher forecasting precision. With the growth of the database, more and more cases will be collected and used as training set.

PSuA-25

Reinforcement Learning Algorithms Based on mGA and EA with Policy Iterations

Changming Yin1, Liyun Li1, Hanxing Wang2
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2.Shanghai University, China

We contribute two new algorithms in this paper called PImGA and PIrlEA respectively in which we construct populations online in each iteration. Every iteration process in these two algorithms does not like the normal EA and GA in which they employ the ine_cient value iteration method in general, instead of, in this paper, we employ the efficient policy iteration as the computation method for searching optimal control actions or policies. Meanwhile,these algorithms also do not like general EA and GA for selection operator to get a optimal policy, instead of we make the Agent learning a good or elite policy from its parents population. The resulted policy will be as one of elements of the next population. Because this policy is obtained by taking optimal reinforcement learning algorithm and greedy policy, the new population always can be constructed by applying better policies than its parents, that is to say, the child or o_spring will inherit parents' good or elite abilities. Intuitively, for a _nite problem, the resulted population from simulation will accommodate the near optimal policies after a number of iterations. Our experiments show that the algorithms can work well.

PSuA-26

Artificial Evolution and Simulation Based Multi-objective Optimization of Passive Power Filters

Shuguang Zhao, Liyu An, Mingming Zhang, Huan Tang
Donghua University, China

Motivated by our successes in evolvable hardware research, a novel approach to optimal design of Passive Power Filters (PPFs) was investigated in this paper. It is characterized by an improved Genetic Algorithm (GA) with an efficient encoding scheme based on preferred component values, a mechanism of multi-objective integration and evaluation based on PSpice simulation and dynamic adjusting of weight vectors selected with uniform design technique, and an adaptation technique for the genetic parameters to track the GA process and maintain individuals' diversity. The experimental results show the approach can find out effective design results of PPFs to meet the main optimizing targets.

PSuA-27

Research on an Available Bandwidth Measurement Model Based on Regression Model

Fengjun Shang
Chongqing University of Posts and Telecommunications, China

Inferring the available bandwidth is of great importance for various network applications. In this paper, an available bandwidth measurement model is introduced based on regression model that can be used to high-speed IP network. The core of model has four parts as follows: 1) introducing the least absolute deviation method to compute regression coefficient. 2) deducing between delay and time interval. The advantages of the model are the lower cost and overhead, higher accurate result, independent clock synchronization. 3) deducing relation between sampling probability and background traffic. 4) introducing linear programming method to deal with the least absolute formula. The model is valid by simulation verification.

PSuA-28

A Software Method to Model and Fabricate the Defective Bone Repair Bioscaffold Using in Tissue Engineering

Qingxi Hu, Hongfei Yang, Yuan Yao
Shanghai University, China

In this paper, biologic properties and physical properties of the bioscaffold are studied. The requirements of the model of defective bone repair bioscaffold are proposed. Then, a new modeling method is presented, which can construct a defective bone repair bioscaffold 3d digital model that has the macro-shape and macro-pores. This method combines the image processing technology, 3d-reconstructing technology, and a new hole filling method, in which a mapping method is developed. It can be used in both symmetrical and unsymmetrical defective bone. By programming, this method was successfully implemented and the repair bioscaffold 3d digital model was constructed. Through RP process, using polymeric blends, the physical model was obtained, which meets the requirements of the bioscaffold.

PSuA-29

Scalable Internet Congestion Control by Bio-Inspired Computational Intelligence

Morteza Analoui, Shahram Jamali
IUST University, Iran

In this paper congestion window (W) of each source is imagined as a species and then the congestion control problem is redefined as population control of W species. Toward this idea, this paper uses the predation and the competition tactics to control the population size of W and design a congestion control algorithm. We outline a procedure by which the proposed model can be implemented in a scalable manner, in the sense that its performance is maintained for arbitrary number of sources. Dynamic and equilibrium properties of the designed algorithm show success of this mapping. According to the simulation results, this algorithm is fair, stable, and high-performance.

PSuA-30

Principle of 3-D Passive Localization Based on Vertical Linear Array and Precise Analysis

Yi Qu, Zhong Liu, Hongning Hu
Naval University of Engineering, China

A system based on vertical linear array is brought forward. The localization model is presented, and the localization principle of vertical linear array is discussed. With range, elevation angle induced from time-delay and the measurement of azimuth angle, three dimensional equation of state and equation of measurement have been established. The localization precise according to length of baseline and precise of time-delay is simulated and analyzed. According to the observability principle of nonlinear system, the observability qualifications of the system are given.

PSuA-31

An Efficient Version on a New Improved Method of Tangent Hyperbolas

Haibin Zhang1, Qiang Cheng2, Yi Xue1, Naiyang Deng3
1.Beijing University of Technology, China
2.Chinese Academy of Sciences, China
3.China Agricultural University, China

A new inexact method of tangent hyperbolas (NIMTH) has been proposed recently. In NIMTH, the Newton equation and the Newton-like equation are solved respectively by one Cholesky factorization (CF) step and p preconditioned conjugate gradient (PCG) steps, periodically. The algorithm is efficient in theory. But its implementation is still restricted. In this paper, an efficient version of NIMTH is presented, in which the parameter p is independent of the complexity of the objective function, and its tensor terms can be efficiently evaluated by automatic differentiation. Further theoretical analysis and numerical experiments show that this version of NIMTH is of great competition for the middle and large scale unconstrained optimization problems.

PSuA-32

A VSC Algorithm for Nonlinear System Based on SVM

Yibo Zhang, Jia Ren
Zhejiang Sci-Tec University, China

A variable structure control (VSC) algorithm for nonlinear system based on feed-forward and feedback technology is developed. A method based on feed-forward SVM (FFSVM) is brought forward to eliminate external disturbance. In order to reduce difference and to track desired trajectory, a feedback SVM (FBSVM) is introduced into the feed-forward system by adopting VSC algorithm. And so recognition and control designing are combined, and recognition of system is avoided. High track speed and robustness are granted. Simulation shows the effectiveness of the scheme.

PSuA-33

IAOM: An Integrated Automatic Ontology Mapping Approach towards Knowledge Integration

Jiangning Wu, Yonggui Wang
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Ontology mapping, with the purpose of finding the semantic correspondences between two existed overlapped ontologies, has been the key technique for solving the integration of ontology-based knowledge systems. Currently, ontology mapping is largely determined manually by domain experts, thus a time-consuming and labor-intensive process. In this paper, we propose an integrated automatic ontology mapping algorithm based on three dimensions of linguistics, structure and instance combining commonsense knowledge with domain knowledge from the systematic point of view. Experimental results on two course ontologies are presented, and show that the algorithm discovers semantic mappings with a high degree of accuracy.

PSuA-34

Symbolic Model Checking temporal logics of

knowledge in Multi-Agent System Via Extended Mu-Calculus

Lijun Wu, Jinshu Su
National University of Defense and Technology, China

Clarke and McMillan presented symbolic approaches to model check temporal logics via mu-calculus and OBDDs. These approaches are very efficient and can be applied to verify many practical systems with extremely large state spaces in excess of 1020 states. However, these approaches cannot model check knowledge logics. But temporal logics of knowledge can describe more accurately the desirable specification of systems and protocols in distributed systems. In this paper, the symbolic approaches to model check the temporal logic of knowledge via extended mu-calculus and OBDDs are discussed mainly. First the mu-calculus is extended. Then the symbolic approaches to model check temporal logics of knowledge via extended mu-calculus and OBDDs are presented.

PSuA-35

A Computer Security Model of Imitated Nature Immune and Its FSM

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1.Hebei University, China
2.Hebei Jiaotong Vocational & Technical College, China
3.Tianjin University, China

According to the nature immunology, This paper describe a computer security model imitated the principle of nature immunity, GECISM (GEneral Computer Immune System Model). The model is structured by agents. The agent imitates the immune cells. Through rules and co-operation the agent discriminate “self” and “non-self”. Further it eliminates “non-self”. The FSM model of GECISM accurately describes this system and meanwhile is the basement of performance analysis and system test about GECISM.

PSuA-36

A Novel Object Tracking Algorithm Based on Discrete Wavelet Transform and Extended Kalman Filter

Yinghua Lu1,2, Ying Zheng1,2, Xianliang Tong1,2, Yanfen Zhang1,2, Jun Kong1
1.Northeast Normal University, China
2.Key Laboratory for Applied Statistics of MOE, China

A new method for detecting and tracking multiple moving objects based on discrete wavelet transform and Extended Kalman filter is proposed in this paper. Although Kalman filter tracks moving objects accurately, it requires a heavy computational burden. Discrete wavelet transform has a nice property that it can divide a frame into four different frequency bands without loss of the spatial information, we use Kalman filter on low frequency sub-band so it can reduce the computational burden and remove most of the fake motions in the high frequency sub-band. In tracking multiple moving objects, many applications have problems when objects pass across each other. We exploit pattern matching in a simple feature space for solving this problem. The experimental results prove the feasibility and usefulness of the proposed method.

PSuA-37

Shallow-water Bottom Target Detection Based on Time, Frequency Dispersive Channel and Adaptive Beamforming Algorithm

Qiang Wang1, Xianyi Gong2
1.China Jiliang University, China
2.Zhejiang University, China

In active sonar system, the detection of bottom object in shallow water is usually a difficult task since the reverberation, which consisting of a large number of spurious echoes, and generates a lot of false alarm. The propagation channel exhibits time-spreading distortion(TSD) and fast fading distortion(FFD) in ocean. The distortion mechanisms degrade optimum detector performance and reduce the performance of high resolution detector in shallow water. The recursive adaptive beamforming based on the recursive least square(RLS) and the generalized sidelobe canceller(GSC) structure is constructed for uniform circular receiving array application. Then we combined detectors based TSD/FFD channel model with RLS-GSC, to enhance bottomed object detection performance in littoral area. The approach is evaluated experimentally using real-data set and in simulation test. It improves detection signal-to-reverberation ratio(SRR) and also reduce false alarm probability in real conditions.

PSuA-38

Classification Rule Acquisition Based on Extended Concept Lattice

Yan Wang, Ming Li
Lanzhou University of Technology, China

Classification is an important task in data mining. The number of rules which are obtained through traditional classification rule acquisition algorithm is much enormous. Concept lattice is powerful tool for data mining and rule acquisition. Through analyzing characteristic of concept in concept lattice, extended concept lattice and classification rule acquisition based on extended concept lattice are proposed. Experiment results show that this algorithm can obtain simple and understandable rule set.

PSuA-39

Application of Bayesian Network to Tendency Prediction of Blast Furnace Silicon Content in Hot Metal

Wenhui Wang
Zhejiang Water Conservancy and Hydropower College, China

This paper proposes a new method for predicting the change tendency of silicon content in hot metal based on Bayesian networks. Firstly, some important factors that affect silicon content are selected out using grey relationship analysis (GRA). Secondly, a Bayesian network (BN) model is constructed to predict silicon content in hot metal based on the causal relationship of the factors. The model shows good performance due to the high percentages of prediction hitting the target, and can help

blast furnace (BF) foreman acquaint himself with the status of BF.

PSuA-40

Research of Sludge Compost Maturity Degree Modeling Method Based on Wavelet Neural Network for Sewage Treatment

Meijuan Gao1,2, Jingwen Tian1,2, Wei Jiang1, Kai Li2
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2.Beijing University of Chemical Technology, China

Because of the complicated interaction of the sludge compost components, it makes the compost maturity degree judging system appear the non-linearity and uncertainty. According to the physical circumstances of sludge compost, a compost maturity degree modeling method based on wavelet neural network is presented. We select the index of compost maturity degree and take high temperature duration, moisture content, volatile solids, the value of fecal bacteria, germination index as the judgment parameters. We adopt a method of reduce the number of the wavelet basic function by analysis the sparse property of sample data, and use the learning algorithm based on gradient descent to train network. With the ability of strong function approach and fast convergence of wavelet network, the modeling method can truly judge the sludge compost maturity degree by learning the index information of compost maturity degree. The experimental results show that this method is feasible and effective.

PSuA-41

A model of time performance of a hybrid Wired/Wireless system

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The PHY layer in RFieldbus system, which has hybrid wired and wireless segment, integrates two different traditional Asynchrony + DSSS in wired and wireless segment respectively, but with the unique FDL protocol of token-Passing. In order to evaluate the transmission time-performance in such a hybrid system, the protocol stack has been modeled as a multi-server-single-queue, which its target token-rotation time meets a dynamic boundary. The polling-time on the slaves was transformed into an internal token walking time, and the rest two lower priority queues were transformed into two M/G/1/∞ systems with two different Poisson arrival rates, so that the complexities of the time properties when transmission happens in different segment can be depicted easily by 7 different parameters. Then, a simulator RF-P based on OMNet++ platform is constructed with a 4-layers infrastructure. The top layer is the system-module inclosing 4 compound modules, which was composed by different simple modules on bottom layer. The comparison with the real measuring in 13 typical network infrastructures of RFieldbus show: 1, the error deviation of RF-P model is not more then 25%, and is about 10% when there is no mobile segment or stations in the measuring scenarios. 2, Error bias is smaller when the system load is lower. 3, The accuracy of the simulator is better when there is no TCP/IP traffic in the system.

PSuA-42

Research on Applications of a New-type Fuzzy-neural Network Controller

Xiucheng Dong1,2, Haibin Wang1, Qiang Xu1, Xiaoxiao Zhao1
1.Xihua University, China
2.Tsinghua University, China

A new fuzzy neural network is introduced in this paper which employs self-organization competition neural network to optimize the structure of the fuzzy neural network, and applies a genetic algorithm to adjust the connection weights of the fuzzy neural network so as to get the best structure and weights of the fuzzy neural network. Simulations are made when the pole becomes 2 meters and the random white noise is added in the cart-pendulum system, and control effects of the Adaptive Neural Fuzzy Illation System (ANFIS) and Genetic Algorithm Fuzzy Neural Network (GAFNN) are analyzed. Simulation results indicate that GAFNN controller has greater control performance, high convergence speed, strong robustness and better dynamic characteristics. The effectiveness of the method introduced in this paper is demonstrated by its encouraging study results.

PSuA-43

A Novel Agent Coalition Generation Method Based on Fuzzy Set Theory

Chunhua Yu, Xueqiao Du, Na Xia
Hefei University of Technology, China

In Multi-Agent System, the generation of agent coalition is a key topic. It mainly researches how to generate the task-oriented optimal agent coalition. This paper proposes a novel coalition generation method based on fuzzy set theory. Defines a membership function, by which the membership degree of an agent to a coalition is calculated as a value between 0 and 1, and then the task-oriented coalition can be generated by λ matrix theory. An example is presented to illustrate the validity of the method.

PSuA-44

An Interactive Fuzzy Multi-Objective Optimization Approach for Crop Planning and Water Resources Allocation

Huicheng Zhou, Hui Peng, Chi Zhang
Dalian University of Technology, China

A fuzzy multi-objective crop planning model is formulated for determining the optimal crop pattern and irrigation water resources allocation in the irrigated agriculture, in which the individual farmers and irrigation administrators put their views on three conflicting objectives: maximum of net returns, maximum of expected grain yield, and maximum of environmental returns. An interactive fuzzy multi-objective optimization (IFMOO) approach is applied to develop the sustainable crop planning for solving problems of vagueness and imprecision information related to data, model formulation and decision maker's preferences involving in multi-objective linear

programming (MOLP). The methodology is illustrated in a case study of crop pattern alternatives in Xingkaihu Lake Irrigation District of northeastern China. The incorporation of these socio-economic and environmental objectives demonstrates the capability of IFMOO approach and also works suitably in water resources management by trade-off procedures.

PSuA-45

A P2P Trust Model Based on Multi-Dimensional Trust Evaluation

Xinsheng Wang, Peng Liang, Huidong Ma, Dan Xing, Baozong Wang
Yanshan University, China

The current P2P trust models suffer much from dishonest feedbacks and the trust metrics depending on subjective judgment excessively results in rough trust value. So this paper proposes a versatile trust model based on multi-dimensional trust evaluation, MDTrust. The concept of multi-dimensional trust is introduced and the approach of evaluation which uses the joint of subjective and objective evaluation is presented. We use the discrete degree of the set of evaluation similarity between peers' evaluation to measure the feedback credibility, in order to resolve the problem of collusion and bad-mouthing. Consequently, simulation and analysis shows that MDTrust can calculate the trust value effectively and reasonably and discard the malicious peers from P2P system.

PSuA-46

Fuzzy Sliding Mode Tracking Control for a Class of Uncertain Nonlinear Systems

Jinping Wang, Yanhua Wang, Xiqin He, Shengjuan Huang
University of Science and Technology Liaoning, China

A class of T-S fuzzy models with parameter perturbations, input and external disturbances is studied in this paper. Both the case of matched uncertainties and the case of mismatched uncertain- ties are investigated using variable structure control technique and LMI method. Firstly, we study the problem of stabilization of T-S fuzzy systems by using a variable structure controller. Secondly, for the given reference model, we design another variable structure controller such that the system output tracks the reference system output in a finite time interval. Finally, the simulation example is employed to illustrate the validity and effectiveness of the proposed method.

PSuA-47

Satellite Cloud Image De-Noising and Enhancement by Fuzzy Wavelet Neural Network and Genetic Algorithm in Curvelet Domain

Xingcai Zhang, Changjiang Zhang
Zhejiang Normal University, China

A satellite cloud image is decomposed by discrete curvelet transform (DCT). In-complete Beta transform (IBT) is used to obtain non-linear gray transform curve so as to enhance the coefficients in the coarse scale in the DCT domain. GA determines optimal gray transform parameters. Information entropy is used as fitness function of GA. In order to calculate IBT in the coarse scale, fuzzy wavelet neural network (FWNN) is used to approximate the IBT. Hard-threshold method is used to reduce the noise in the high frequency sub-bands of each decomposition level respectively in the DCT domain. Inverse DCT is conducted to obtain final de-noising and enhanced image. Experimental results show that proposed algorithm can efficiently reduce the noise in the satellite cloud image while well enhancing the contrast. In performance index and visual quality, the proposed algorithm is better than traditional histogram equalization and unsharpened mask method.

PSuA-48

The Research of the Sensor Fusion Model Based on Fuzzy Comprehensive Theory

Xiaodan Zhang, Zhendong Niu, Xiaomei Xu, Kun Zhao, Yunjuan Cao
Beijing Institute of Technology University, China

A new decision sensor fusion model based on the fuzzy theory, which introduces fuzzy comprehensive assessment into traditional decision sensor fusion technology, is proposed in this paper. Through compare the difference between the architecture of hard decision and soft decision, the soft decision architecture had been applied. At the fusion center, the process of fusion is composed of the comprehensive operation and the global decision, and the global decision of the concerned object could be obtained by fusing the local decision of multiple sensors. In the practical application, the model has been successfully applied in the temperature fault detection and diagnosis system of Jilin Fengman Hydroelectric Simulation System. In the analyses of factual data, the performance of the system precedes that of the traditional diagnosis method.

PSuA-49

Predicting the Free Calcium Oxide Content on the Basis of Rough Sets, Neural Networks and Data Fusion

Yunxing Shu1,2, Shiwei Yun2, Bo Ge1,2
1.Wuhan University of Technology, China
2.Luoyang Institute of Science and Technology, China

This study first created a model to predict the content of free calcium oxide (fCaO) of the calcined clinker in the rotary kiln by adopting the technologies of rough sets, neural networks and data fusion. And then it was used to predict the quality of the calcined clinker in the rotary kiln and pleasant simulation results were obtained, indicating that the model is valid and has attained the goal of increasing the training speed and precision. Besides, it has solved many problems in the course of cement production, such as big inertia, lagging, time variation, serious nonlinearity, multiple parameters, serious coupling, and difficulty in creating systematic models.

PSuA-50

Global Translational Motion Estimation (GTME)

Yang Tao1, Zhiming Liu2, Yuxing Peng1
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2.Nanhua University, China

Motion estimation and motion compensation are included

as major technologies into the existing video coding standards, which generate the motion vectors that determine how each motion compensated prediction frame is created from the reference frame. As traditional motion vectors are 2-dimensional and translational, they could not represent the actual moving directions of objects or blocks in frames. This paper proposes the special idea of GTMV (global translational motion vector), and then presents us the nearly Full Search Motion Estimation and Motion Compensation algorithms based on GTMV. Experimental results based on the H.264/AVC reference software of JM10.1 show that the proposed algorithms could get a better video compression performance and could improve the coding efficiency despite increasing some coding complexity.

Poster Session 2
10:30 – 11:30

PSuB-1

An Algorithm Based On Nonlinear PCA and Regulation For Blind Source Separation of Convolutive Mixtures

Liyan Ma, Hongwei Li
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This paper proposes a method of blind separation which extracts independent signals from their convolutive mixtures. The function is acquired by modifying a network's parameters so that a cost function takes the minimum at anytime. Firstly we propose a regulation of a nonlinear principle component analysis (PCA) cost function for blind source separation of convolutive mixtures. Then by minimizing the cost function a new recursive least-squares (RLS) algorithm is developed in time domain, and we proposed two update equations for recursively computing the regularized factor. This algorithm has two stages: one is pre-whitening, the other is RLS iteration. Simulations show that our algorithm can successfully separate convolutive mixtures and has fast convergence rate.

PSuB-2

A Novel ANN Model Based on Quantum Computational MAS Theory

Xiangping Meng1, Jianzhong Wang2, Yuzhen Pi1, Quande Yuan1
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2.Northeast Dianli University, China

Artificial Neural Networks (ANNs) are powerful computational modeling tools, however there are still some limitations in ANNs. In this paper, we construct a new artificial neural network, which based on MAS theory and quantum computing algorithm. All nodes in this new ANN are presented as quantum computational (QC) agents, and these QC agents have learning ability via implementing reinforcement learning algorithm. This new ANN has powerful parallel-work ability and its training time is shorter than classic algorithm. Experiment results show this method is effective.

PSuB-3

Robust Speech Endpoint Detection Based on Improved Adaptive Band-Partitioning Spectral Entropy

Xin Li1,2,3, Hua-Ping Liu3, Yu Zheng3, Bolin Xu1
1.Nanjing University, China
2.Institute of Automation, CAS, China
3.Shanghai University, China

The performance of speech recognition system is often degraded in adverse environments. Accurate Speech endpoint detection is very important for robust speech recognition. In this paper, an improved adaptive band-partitioning spectral entropy algorithm was proposed for speech endpoint detection, which utilized the weighted power spectral subtraction to boost up the signal-to-noise ratio (SNR) as well as keep the robustness. The idea of adaptive band-partitioning spectral entropy is to divide a frame into some sub-bands which the number of it could be selected adaptively, and calculate spectral entropy of them. Although it has good robustness, the accuracy degrades rapidly when the SNR are low. Therefore, the weighted power spectral subtraction is presented for reducing the spectral effects of acoustically added noise in speech. The speech recognition experiment results indicate that the recognition accuracy have improved well in adverse environments.

PSuB-4

Informational Structure of Agrobacterium Tumefaciens C58 Genome

Zhihua Liu, Sun Xiao
Southeast University, China

Base-base correlation (BBC) method, based on information theory, translates a DNA sequence into a 16-dimensional vector. It has proven quite effective in distinguishing various functional regions on one chromosome. In this study, we explore the potential use of distinguishing different chromosomes within one species, with particular emphasis on Agrobacterium tumefaciens strain C58. Our findings show that BBC method could effectively distinguish informational structure of Agrobacterium tumefaciens strain C58 genomes. In conclusion, BBC provides a new methodology in post-genome informatics and its applications could be further explored in the further.

PSuB-5

Distinguish Different Acupuncture Manipulations by Using Idea of ISI

Jiang Wang1, Wenjie Si1, Limei Zhong2, Feng Dong1
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2.Northeast Dianli University, China

As well-known, the science of acupuncture and moxibustion is an important component of Traditional Chinese Medicine with a long history. Although there are a number of different acupuncture manipulations, the method for distinguishing them is rarely investigated. With the idea of the interspike interval (ISI), we study the electrical signal time series at the spinal dorsal horn produced by three different acupuncture manipulations in Zusanli point and present an effective way to distinguish them. Comparing with the traditional analysis methods, like

phase space reconstruction and largest Lyapunov exponents, this new method is more efficiently and effective.

PSuB-6

A MAC Protocol to educe Sensor NetworkPower Consumption: Simulation of DMD Protocol

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Wireless Sensor Networks impose additional challenges on Mediom Access Control mechanisms. Many schemes have been proposed that use either CSMA or TDMA protocols; however design of a CSMA protocol for WSNs must be more than a general purpose mechanism. In this work, we analyze the parameters of DMD protocol and their affect on performance. Various MAC protocols with different objectives were proposed for wireless sensor networks. We examine how to use upcalls to notify applications of the underlying channel utilization to enable an application to change its sampling phase, sampling interval, or aggregation methods. Using these principles, we implemented a network with 5 nodes to implement a DMD protocols simulation and we show the result of power consumption with increase in period of MD State.

PSuB-7

Simulation of Virtual Human's Mental State in Behavior Animation

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Human mental state is related to outer stimuli and inner cognitive appraisal, and it mainly includes emotion, motivation, personality and social norm. Modeling mental state of virtual humans is very important in many fields. Simulating virtual humans with mental state is a challenging branch of computer animation, where virtual humans are regarded as agents with sense, perception, emotion, personality, motivation, behavior and action. 3D virtual humans are constructed with sensors for perceiving external stimuli and are able to express emotions autonomously. Mental state-based animation is demonstrated in a prototype system.

PSuB-8

A Novel Watermarking Scheme Based on PSO Algorithm

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In this paper, a novel blind watermark extracting scheme using the Discrete Wavelet Transform (DWT) and Particle Swarm Optimization (PSO) algorithm is introduced. The watermark is embedded to the discrete multiwavelet transform (DMT) coefficients larger than some threshold values, and watermark extraction is efficiently performed via particle swarm optimization algorithm. The experimental results show that the proposed watermarking scheme results in an almost invisible difference between the watermarked image and the original image, and is robust to common image processing operations and JPEG lossy compression.

PSuB-9

Face detection based on BPNN and wavelet invariant moment in video surveillance

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A multi-view face detection method for Video surveillance is proposed in this paper. It provides the ability to extract high-level features in terms of human activities rather than low-level features like color, texture and shape. The method is capable of locating human faces over a broad range of views in color image sequences or videos with complex scenes. Firstly, an improved frame difference is used to acquire promising regions of the image. Then it uses the presence of skin-tone pixels to locate faces. Finally, an improved method based on wavelet invariant moment and BPNN is used to verify the candidate face regions. The experimental results show that the proposed algorithm has high speed and low error-detection rate, so it can be used in the real-time video surveillance system. The main distinguishing contribution of this work is being able to detect faces irrespective of their poses by using the wavelet invariant moments as input of the BPNN, whereas contemporary systems deal with frontal-view faces only. The other novel aspect of the work lies in its accuracy of acquiring the candidate area to segment objects from background with the help of motion information and skin information.

PSuB-10

Efficient Topological Reconstruction for Medical Model Based on Mesh Simplification

Chunxiang Dai, Ying Jiang, Qingxi Hu, Yuan Yao, Hongfei Yang
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Due to the complex and time-consuming of the reconstructed medical model, a novel method was proposed to rebuild an apparent and complete topological structure, which is necessary for mesh simplification based on a STL mode1. Firstly the sequence of rebuilding the topology information for various geometric elements was determined. Then, the Red-Black-Tree structure was conducted to get high efficiency for both vertex equivalence testing and element searching when deleting a large number of redundant vertexes. This structure can also handle disorderly and unsystematic data well. Finally, the relation of a vertex and faces was fully exploited to build the edge records, which are used in mesh simplification. This method can improve the mesh simplification procedure more effectively.

PSuB-11

Repetitive Motion Planning of Redundant Robots Based on LVI-Based Primal-Dual Neural Network and PUMA560 Example

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A primal-dual neural network based on linear variational inequalities (LVI) is presented in this paper, which is used

to solve the repetitive motion planning of redundant robots. To do so, a drift-free criterion is exploited. In addition, the physical constraints such as joint limits and joint velocity limits are incorporated into the problem formulation of such a scheme. The scheme is finally reformulated as a quadratic programming (QP) problem and resolved at the velocity-level. Compared to other computational strategies on inverse kinematics, the LVI-based primal-dual neural network is designed based on the QP-LVI conversion and Karush-Kuhn-Tucker (KKT) conditions. With simple piecewiselinear dynamics and global (exponential) convergence to optimal solutions, it can handle general QP and linear programming (LP) problems in the same inverse-free manner. The repetitive motion planning scheme and the LVI-based primal-dual neural network are simulated based on PUMA560 robot manipulator with effectiveness demonstrated.

PSuB-12

Tensile Test to Ensure a Safety of Cannula Connection in Clinical Ventricular Assist Device (VAD)

Takashi Tanaka, Tomohiro Shima, Masateru Furusato, Yuma Kokuzawa, Kazuhiko Ito, Kiyotaka Iwasaki, Yi Qian, Mitsuo Umezu
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A pneumatic driven ventricular assist device (VAD) is not only designed for short-term usage of a “bridge to recovery” (BTR) in cardiac function recovery, but also developed to apply as a “bridge to transplantation” (BTT) for cardiac transplant. However, in the latter, the VAD must be exchanged before its expiries of guarantee. In this research, the authors have investigated the connector’s strength between connector and cannula, and safety during the VAD exchange.

PSuB-13

A Reproduction of Inflow Restriction in the Mock Circulatory System to Evaluate a Hydrodynamic Performance of a Ventricular Assist Device in Practical Conditions

Masateru Furusato1, Tomohiro Shima1, Yuma Kokuzawa1, Kazuhiko Ito1, Takashi Tanaka1, Kiyotaka Iwasaki1, Yi Qian1, Mitsuo Umezu1, Zhi-Kun Yan2, Ling Zhu2
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A novel in vitro mock circulatory system, which enables to reproduce an inflow restriction, simulating blood volume pooling due to heart failure, was developed to evaluate a hydrodynamic performance of a pulsatile ventricular assist device (VAD) in practical conditions. The concept of this development was motivated by a difference of an inflow restriction between in vitro and in vivo environments. The major idea of this study is to reproduce an inflow restriction by using a centrifugal pump placed at an inflow side of a left ventricular model instead of a constant head reservoir in a conventional circuit. In the novel circuit, the maximum flow rate was obtained at lower systolic fraction as compared with a conventional circuit. This similar tendency by the novel one was observed in an acute animal experiment in sheep. This result suggests that a new mock circuit is effective to confirm a practical drive strategy of the VAD for various diseased conditions.

PSuB-14

Comparison research on agent-based production planning model: product view and resource view

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Distributed production planning model has been used in some manufacturing systems. These models make production decision in single manufacturing centre independently. The optimal result can be worked out by coordination between these production nodes. Based on Multi-Agent System (MAS), this paper proposes two methods to build the distributed production planning model. One makes optimal production decision through adjusting the product inner price or amount, which is from a point of product view. Another makes optimal decision through production capacity auction, which is based on resource view. Numeric example demonstrates that these two methods are all effective but their performances are different. Comparison study shows that the model based on resource view is better.

PSuB-15

Intelligent Detection System to Diagnose of Cirrhosis Disease: Combining Generalized Discriminant Analysis and Artificial Immune Recognition System

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In this paper, we have proposed a new automated detection system based on Generalized Discriminant Analysis (GDA) and Artificial Immune Recognition System (AIRS) to diagnose the portal vein Doppler signals belong to the patients with cirrhosis and healthy subjects. The proposed system comprises of three stages. In the fist stage, Power spectral densities (PSD) of the portal vein Doppler signals were obtained using Short Time Fourier Transform (STFT) method. In the second stage, the GDA method has been applied to power spectral densities (PSD) of the portal vein Doppler signals as pre-processing. Finally, we have run the AIRS classifier system to classify the inputs obtained from GDA method. The robustness of the proposed method is examined using classification accuracy and 10-fold cross-validation method. The classification accuracies obtained from AIRS and the proposed system are 88.89% and 100% using 10 fold cross validation, respectively. The proposed system that we have built had given very promising results in diagnosing the cirrhosis disease.

PSuB-16

Application of Stepwise Regression in Skin Micro-image Feature Selection

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In skin micro-image recognition, it is important to select the independent feature parameters in classification and

recognition. In this paper, stepwise regression is applied to the skin micro-image feature selection and is validated by the classification method using Mahalanobis distance. Experimental results indicate that the application of this method is effective in skin micro-image processing.

PSuB-17

Food–chain Algorithm: Ideology, Design and Analysis

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The characteristics of artificial life are emergence and dynamic interaction with the environment, and food-chain phenomenon appears to be an important and widespread phenomenon in the living system. Based on those ideas, we define the local action rules of artificial-life and propose a new kind of artificial-life algorithm. It is referred as Food-Chain Algorithm. Food-chain algorithm is a kind of artificial-life algorithms that achieves optimization computation by mimicking the evolution of natural ecosystem and the information processing mechanism of natural organisms. In the first, we describe the definition, ideology, and flow of food-chain algorithm. In the second, we discuss the energy rules of artificial-life metabolism and the transformation rules of movement range of artificial-life individuals. In the end, we analyze the key parameters of the algorithm influencing its performance in detail, and compare with real-coded genetic algorithm by standard functions. According to the test results, we find that food-chain algorithm is more predominant in function optimization. On the other hand, food-chain algorithm has lifelike traits, and it is fit to deal with the optimization problems of lifelike systems.

PSuB-18

Design of Ecologically Inspired Distributed Search in P2P Environments

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The principles of emergence have received a lot of interest in the study of complex system, such as peer-to-peer system. In this paper, we reported an ecosystem inspired algorithm for searching peer-to-peer networks. An agent-based model had been developed to solve the problems caused by the blind flooding-based search, such as inefficient search and traffic, etc. Reinforcement learning and evolution of the agents can change the agents population toward sampling areas of the environment that are close to resources by increasing the density of agents near those sources.

PSuB-19

Doppler Blood Flow Spectrogram Enhancement Based on the Matching Pursuit with Wigner Distribution

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This paper presents a method, called matching pursuit with Wigner distribution (MPWD), for the noise and speckle reduction in the spectrograms of Doppler blood flow signals. Using this method, a segmented Doppler ultrasound signal is first decomposed into a linear expansion of waveforms, called time-frequency atoms, which are selected from a redundant dictionary named Gabor functions. Then a decay parameter-based algorithm is employed to determine the decomposition times for de-noising the Doppler ultrasound signal. Finally, the Wigner distribution is calculated and averaged during each segment to reconstruct the spectrogram of the de-noised signal for Doppler speckle reduction. Results from the experiments on simulation and clinical signals show that the MPWD method performs effectively in reducing noises, eliminating the Doppler speckles, and improving the precision of spectrograms and their max frequency curves.

PSuB-20

Modeling and Control of Remotely Operated Vehicles

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The motion of remotely operated vehicles (ROV) in deep water exhibits a highly nonlinear nature. The main contribution of this work is to approximate the nonlinear model of an underwater ROV, by continuous piecewise linear (PWL) approximation method. Based on the modern approximation scheme, the dynamic equations governing the motion of ROV are piecewise linearized, such that the approximated model emulates vehicle dynamics and hence becomes suitable for control by rich literature on linear methods. The dynamics of motion is considered only in the horizontal plane, and gain scheduling technique is adopted as the natural choice for control of local subsystems. A simulation study is carried out to show that the proposed modeling scheme allows precise control of ROV motion in 3 degrees of freedom (DOF)

PSuB-21

A Multi-domain Unified Modeling Method and Its Applications in Medical Simulation

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The object of medical simulation is organismal systems in human body, which is too complicated to be modeled and simulated accurately. As it consists of different domain subsystems, it cannot be modeled efficiently using different modeling tools integration method. There is a newly developed multi-domain unified modeling method more and more widely be used in engineering field. The corresponding language, Modelica, becomes a standard for unified modeling. The modeling process of this language is introduced, and the examples for modeling and simulation of human cardiovascular system are given. This method can be used in modeling the synthetic biological systems and medical instruments potentially.

PSuB-22

Recognition of Gene Splice Sites Based on Synthesis Markov Model Learned by Support Vector Machine

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The genomes of a wide range of organisms have been sequenced in the past few years. However, it is still a great challenge how to correctly predict genes from huge amounts of sequences data. Splice sites recognition is an important step to predict gene effectively. In this paper, we proposed a new synthesis prediction approach based on Markov model learned by support vector machine using maximum-margin principle. Experiment results demonstrate that this new synthesis approach can achieve better performance for splice sites identification than Markov model trained by maximum likelihood estimation method, which suggest that this approach applies to other signal detection problem in genomic sequences.

PSuB-23

Immune Clonal Strategy Based on the Adaptive Mean Mutation

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Based on the clonal selection theory, the main mechanisms of clone are analyzed in this paper. A novel strategy algorithm based on Artificial Immune System-Immune Clonal Strategy Algorithm base on the Adaptive Mean Mutation (ICSAMM), is presented, in which the Gauss mutation in the Classical Evolutionary Strategies algorithm (CES) is replaced by the Adaptive Mean one, and the size of algorithm step can be adjusted adaptively. Compared with CES, ICSAMM is shown to be an evolutionary strategy capable of avoiding prematurity, increasing the converging speed and keeping the variety of solution in the simulation. Using the theories of Markov Chain, its convergence is proved.

PSuB-24

The Structure Analysis of Protein Sequences Based on Algebraic Operation

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The nature of genetic code is now fairly well known. In this paper, the protein molecules based on the algebraic operation is studied and the algebraic system by using the natural operation based on Galois field of four bases is introduced. As a results, hydrophobic and hydrophilic amino acids have been found in different columns and it has been show that the codons cannot be randomly arranged in different columns, What is more, the N-dimensional linear sequence space based on codons is established. Furthermore, the invasive species genomic signature by using the algebraic systems is obtained. Finally, a fast algorithm for comparison of pairs of long sequences by using the above-mentioned algebraic operation has been brought up. By means of the practice, the results indicate that the applications of this method are extremely practical and effective. The result is effective and the operation process is simple.

PSuB-25

Power Load Forecasting Model of Neural Networks Optimized by Hybrid Artificial Fish Swarm Algorithm Based on Tabu Search and Genetic Mutation Operator

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Neural networks have been applied to the area of power load forecasting successfully, but normal Back Propagation (BP) algorithm has such disadvantages of local optimization and slow convergence speed. The Artificial Fish Swarm Algorithm (AFSA) is an up-to-date proposed optimizing strategy, which possesses good capability to avoid the local optimization and obtain the global optimization. But during the optimizing process, AFSA is easy to be lead to circuitous searching or heavy assembling round local optimum solution. In order to overcome those disadvantages, this paper introduced the Tabu Search Algorithm and Genetic Mutation Operator into AFSA to construct a hybrid optimizing algorithm. The hybrid algorithm is as simple as AFSA for implement, but can greatly improve the ability of searching the global excellent result and the convergence property and accuracy. The feasibility and effectiveness of our approach was verified through application in the training of neural networks for power load forecasting. The experimental results show that the proposed algorithm is significantly superior to normal BP algorithm and original AFSA.

PSuB-26

Ocular Surgical Decision Model with Neural Networks

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An improved ME model was proposed to provide a modular approach wherein component neural networks are made specialists on subparts of a clinical decision problem. The aim is to develop a new strabotomy planning decision model based on improved nonlinear mixture of experts neural networks to predict the corrective quantity of lateral and medial rectus in strabotomy to instruct and improve practice. The corrective rate of strabotomy from the model is 97% and shows effective prediction. The model with improved ME can offer robustness for application in other clinical decision, which can be implemented to develop an embeddable system for minimized instrument.

PSuB-27

Constitutive Model of Engineered Cardiac Tissue and Characteristics of the Contractile Element

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A parallel three-element constitutive model for collagen-gel based engineered cardiac tissue is proposed; which consists of an active contractile element, an elastic

element, and a viscous dashpot. An original analytical method is developed to identify the characteristics of the contractile element, the elasticity of the elastic element, and the viscosity of the dashpot by analyzing the beating displacement of the engineered cardiac tissue. The results show that the engineered cardiac tissue has of 18.20 kPa elasticity, 5.49×102 Pa·s viscosity, and the characteristics of the contractile element that the maximum contractile force exerts corresponding to the maximum contractile strain rate, closing but preceding the maximum contractile strain. Small contractile force at micro Newton level can be detected by this analytical method. The value of the elasticity coefficient is examined to be reasonable, and the small viscosity coefficient may imply the existence of myofilament sliding effect. These mechanical characteristics of the engineered cardiac tissue are firstly revealed by the present study.

PSuB-28

1D Reconstruction method for Inductive Magnetic Resonance Electrical Impedance Tomography

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A theoretical study on the boundary value problem of inductive magnetic resonance electrical impedance tomography (IMREIT) in the concentric three-layer circle plane conductor model produced by the sinusoidal magnetic field is given in this paper. The analytical solution of the magnetic field and induce electric field is derived by the method of variable separation. Numerical simulations are performed to test the algorithm for both noise-free and noisy cases. The results may provide some preliminary theoretical foundation for the further research on the two dimension and three dimension reconstruction method of the IMREIT.

PSuB-29

Key Technology Research on Wall-Cleaning Robot with Single Suction Cup

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Some typical products and prototypes of wall-cleaning robots appearing recently are introduced in this paper. At present, the development mode for wall-cleaning robot is the traditional development mode based on physical prototype with the disadvantages of high cost, time-consuming and no assurance for high performance. The wall-cleaning robot design method based on virtual prototype technology is proposed. A wall-cleaning robot system with single suction cup is designed and realized based on some basic technologies of wall-climbing robots and common traits of glass-curtain walls of high-rise buildings together in this paper. A new type of omni-directional moving mechanism with driving, turning and overstepping functions is developed which has four wheels driven by four motors respectively, so the robot can move on smooth glass surfaces with the help of its driving wheels and the lifting force of the trolley crane on the roof. The single negative suction cup help robot adhere on the wall. After structures and features analysis of the wall-cleaning robots, mechanical analysis, and reliability analysis model of wall-cleaning robot with single suction cup is proposed in this paper. The safety analysis ensures that the robot can work reliably. Some key techniques on the mechanism and control system development of the wall-climbing mobile robot are discussed in this paper. In order to make the robot working perfectly, we developed a multi-function cleaning apparatus. The apparatus combines the flushing, scrubbing, scraping cleaning mode and environment protection mode. The control system utilizes two-level computer control strategy to realize the moving, absorbing, cleaning, and overstepping obstacles function. Simulation result based on virtual prototype technology shows that the robotic system is feasible and practical.

PSuB-30

A 3D Finite Element Model of Human Pelvis: Development and Its Biomechanical Application to Pelvic Reconstruction

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In this paper, we developed a 3D finite element model of human pelvis and applied it to investigate the biomechanics of pelvic reconstruction after iliac bone tumor resection. A finite-element model of human pelvis was constructed primarily based on a series of traverse CT images of a 42-year-old healthy male. 3D finite element models of different implants including fibula, rod and screw were constructed using ways of solid modeling. Then various reconstructed finite element models were assembled with different finite element implant model and type Ⅰ resected pelvic finite element model. The load of 500 N was imposed vertically onto the superior surface of L3 vertebra body, and the pelvis was fixed in bilateral leg standing positions. Finite-element analysis was performed to account for the stress and displacement distribution on the bones and implants. Stress concentration was found in the fibula after force loading if the internal fixation were not used. After the internal fixation was implanted, stress concentration in the fibula was decreased. Stress concentration was also found in the implants, especially in the connection sites between screw and rod. According to the stability and stress concentration, the method of the double rods plus L5-S1 pedicle screws and ilium screws fixation combined with fibula transplantation is better than other fixation methods in pelvic reconstruction after type Ⅰ resection..

PSuB-31

The Analysis for Performance Parameters and Quality Control of the Production Online

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Firstly, the performance parameters of the products are chosen during the tentative process of the production. Secondly, with the help of keeping down most information of the raw data, wiping off the relativity among the datum and decreasing the influences of disturbance etc., the standard ANFIS simulation of speed sensor are founded. Then, through using hypothesis method, the performance parameters are divided into primary factors and secondary factors. Simultaneously, by using expurgation method a secondary factor is eliminated and a similar ANFIS simulation model is founded according to the remnant performance parameters. Theoretically, many similar ANFIS simulation models are founded. After analyzing the standard model and the similar models, finally the conclusion can be drawn that primary factors and secondary factors of the performance parameters are classified with canonical correlation analysis and principal component analysis. In future in the process of the production the performance parameters will be measured online, the coming wasters can be forecasted, the primary factors should be adjusted quickly to control quality online in factories. The simulation examples demonstrate the accuracy and efficiency of the present method.

PSuB-32

A Simulation of Fractal and Multi-scaling Features in Financial Market and Empirical Evidence from Petroleum Market

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In this paper, we put forward a simple financial market model which is an analogue of random field Ising model (RFIM) under a market maker scenario. By applying the grid network and torus topology, we introduced the periodic boundary condition to the virtual market with heterogeneous agents and a market maker. Furthermore, we introduced the parameters of self confidence and coupling intensity, idiocratical expectations of agents. Combining the Scaling/Multiscaling analysis, we acquired some non-trivial findings: first, in accordance with many empirical results, the price returns of this virtual market generated by our model display Scaling/Multiscaling features; secondly, we found that the price behaviors have the surprising similarities with the real financial market returns. Our findings imply that although the real petroleum markets demonstrate complex superficial behaviors and phenomena, the innate dynamics of the real markets may be fundamentally simple.

PSuB-33

A Genetic Algorithm with DNA for Solving the Container Loading Problem

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Container loading problem with multi-constraints is a complicated combinatorial optimization problem. It's an NP-HARD problem which is difficult to obtain an optimal solution. Considering orientation and stability constraints, a DNA-based genetic algorithm is proposed in this paper to attack the three-dimensional container loading problem. The algorithm uses the DNA encoding method, and requires neither additional assumptions about box sizes or orientations, nor any form of user interaction or intervention. Simulation results show that the proposed algorithm is feasible and effective which could be directly used in practical applications.

PSuB-34

A New Improved Method for Scheduling the Overhaul of the Generator Units

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This paper deals with the overhaul scheduling of the generator units with the improved fuzzy stochastic PERT theory. In order to illustrate the necessity of the theory, we firstly summarized the particularities in the overhaul of the generator units. The fuzzy impact degree of each power plant is invented according to the maintenance practices, which is later improved the traditional PERT. Then the paper discusses the detailed procedures using the improved method to calculate the critical path and the sub-critical paths. And the forward float, backward float and the common float are invented to compare the consequence of the proposed method with the previous ones. Finally we give an example in scheduling the overhaul in the Guodian Shizuishan power plant of China to illustrate the new proposed method and the floats analysis.

PSuB-35

Genetic Algorithm in Architectural-Level Synthesis of Digital Microfluidics-Based

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Digital microfluidic biochips are an emerging implementation of lab-on-a-chip based upon the manipulation of discrete droplets. As more bioassays are executed concurrently on a biochip, system integration and design complexity are expected to increase dramatically. We focus on one such scheduling problem of resource constrained and precedence constrained for digital microfluidic biochips. Since the problem is NP-complete, we present an optimal genetic algorithm solution directly applicable to digital microfluidics. The proposed algorithm, which is based on genetic algorithm for project scheduling, can yield near optimal schedules for multiple biomedical assay of large size in a very short time. A real-life biochemical assay procedure is used to evaluate the proposed method.

PSuB-36

Rectification of Cardiac Output Computation Based on Radial Pulse Wave Hemodynamic Detecting

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Objective: Cardiac output is an important parameter to assess cardiovascular function. Cardiac output used as a routine clinical cardiovascular parameter has been accepted by doctors, pharmacists and physiologist for a long time. Zhichang Luo got the clinically useful form of cardiac output through years of study. This formula has a lot of approximations which based on normal health physiological condition. However, during the long-term experiment, we found that the cardiac output is deviated from its real value in some cases. It is necessary that cardiac output computation should be rectified. Methods: A rectification is regressed through a lot of experiments by using linear regression method. Results: The rectification is correlated with the pulse wave contour parameter, age, blood pressure and heart rate. The rectify cardiac output is closer to the actual value of cardiac output. Conclusion: It is reliable that cardiac output computes through pulse wave contour parameter, age, blood pressure and heart rate in healthy pregnant women, athletes, patients without heart surgery, valve defection, aortic aneurysm, congestive heart failure, bearing premature, and even common healthy people.

PSuB-37

Denoising Method and Simulation Analysis for Speech Based on Wavelet packet and Neural-Network

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A speech denoising method, which is based on combining multi-layer wavelet packet decomposition with neural-network, is presented. It is described as follows: One layer wavelet packet decomposition is first used for noisy speech. Wavelet packet decomposition of different layers is then employed for the approximation signal and the detail signal by different wavelet bases. The nonlinear threshold-filtering and self-learning algorithm of the neural-network are then introduced to the denoising method based on Wavelet packet. At last, the denoised approximation signal and detail signal are superposed after their being reconstructed respectively. The simulation of different SNR speech indicates that this method is more advanced than DJ's hard- and soft-thresholding methods.

PSuB-38

Robust Stability of Human Balance Keeping

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Despite its apparent simplicity, the nature of the control mechanisms that allow humans to stand up is still an object of great research interest [1-9]. In a recent paper [1], a PID controller with a sensory delay is proposed to model the central nervous system for the control of balance keeping; and based on experiment data it is suggested that ageing people with poor balance keeping ability can be explained by a reduced derivative gain in the PID controller. Using the models presented in [1], this paper studies a further topic: robust stability of human balance keeping. Computation methods to find the ranges of the controller parameters for which the closed loop system is stable, and with a given stability phase or gain margin, are presented. An example is used in the paper to demonstrate the application of these methods.

PSuB-39

Fusion of BP Neural Network and PSO and it's Analysis

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After analyzing the advances and disadvantages of BP and PSO, through improving the parameters in PSO with BP algorithm, and training the weights of neural network, a novel selection strategy of the inertial weight is introduced to the PSO algorithm (BPPSO). Also some special particles (rebellion particles) have been considered to this algorithm. The special particles and the other particles work in collaboration and communicate with each other when training the neural network. This new BPPSO algorithm has a perfect construction, in that it can overcome all the defect of BP and PSO to complete the training of network more quickly and exactly. The experimental results show that the proposed hybrid BPPSO algorithm is better than the Particle swarm optimization algorithm (PSO) and BP algorithm in convergent speed and convergent accuracy.

PSuB-40

Optimal Portfolio Management in a Vasicek Framework

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The optimal portfolio problem for a riskless asset, single risky stock and a rolling horizon bond is developed. The stochastic short-term interest rate with Vasieck dynamics affects the prices of the stock and rolling horizon bond. The investment objective is maximizing expected CRRA utility of terminal wealth. The problem has been solved by the stochastic dynamic programming principle and the completion of squares technique. The closed-form optimal trading strategy is obtained. The numerical examples illustrating the results are presented.

PSuB-41

Optimal Investment Consumption Model with Stochastic Interest Rate

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The optimal investment consumption problem for a single riskless bond, a zero-coupon bond and a risky stock modeled by the stochastic interest process has been established. The investment objective is maximizing the utility of his consumption and terminal wealth. By the stochastic dynamic programming principle, the HJB equation for the optimal solution is given. In the case of constant relative risk aversion utility, the analytic optimal trading strategies are derived. The results show that the

optimal proportion allocated in the stock is a constant fraction, but the optimal proportion in the zero-coupon bond is time-variant. The optimal consumption rate is in a feedback form of the wealth and depends on the stochastic interest rate. The numerical simulation illustrating the results is presented.

PSuB-42

Automated Chinese Domain Ontology Construction from Text Documents

Yu Zheng, Wen-xiang Dou, Geng-feng Wu, Xin Li
Shanghai University, China

Ontology as an important knowledge representation tool is widely used in many fields. Constructing domain ontology is a lengthy, costly task. Rapid, accurate construction of ontology has thus become an important topic. In this paper, a method that automates construction of the ontology is proposed. The method integrates text analysis, TF/IDF calculation, association rules extraction, pattern rules matching and RDF technologies. The ontology construction method does not require expenditure of time to select keywords and to define the relations by human edit or expert assistance. The method facilitates user understanding of the content of data and its relevancy, and is able to suggest content that is highly relevant. Experimental results show that the proposed approach can effectively construct Chinese domain ontology from text documents.

PSuB-43

Word Boundary Detection in a Phoneme Sequence in Persian Language Using Recurrent Fuzzy Neural Networks

Mohammad Reza Feizi Derakhshi, Mohammad Reza Kangavari
University of science and technology of Iran, Iran

The word boundary detection has an application in speech processing systems. The problem this paper tries to solve is to separate words of a sequence of phonemes where there is no delimiter between phonemes. In this paper, at first, a recurrent fuzzy neural network (RFNN) together with its relevant structure is proposed and learning algorithm is presented. Next, this RFNN is used to post-detecting word boundaries. Some experiments have already been implemented to determine complete structure of RFNN. Here in this paper, three methods are proposed to encode input phoneme and their performance have been evaluated. Some experiments have been conducted to determine required number of fuzzy rules and then performance of RFNN in post-detecting word boundaries is tested. Experimental results show an acceptable performance.

PSuB-44

An Adaptive Unscented Kalman Filter and Its Application

Zhanxin Zhou, Zhuping Wang
Tongji University, China

In this paper an adaptive unscented Kalman filter (UKF) is proposed for the state estimation of nonlinear system. A switching function is used to select different parameter α, which is a vector in stead of a constant value in the standard UKF. The proposed algorithm is applied in a complex nonlinear system-strapdown inertial navigation system (SINS) initial alignment with stationary base. Monte Carlo simulation results show the superior performances of this approach on filtering precision and alignment time, compared with standard UKF in cases of large initial misalignment.

PSuB-45

An Image Segmentation Algorithm Based on Mumford-Shah Model

Liqun Tang, Kejun Wang, Fenggang Huang, Xianwei Gong
Harbin Engineering University, China

This paper improved traditional level set methods based on Mumford-Shah model by introducing the theory of level set without re-initializing into them. Besides remaining the globe optimization which traditional level set methods owned, the modified method fastens the evolution procedures, and can segment the human brain MRI images or similar images, while the traditional level set methods based on Mumford-Shah model can not. The following experiments indicate that, for most images, ideal segmentation effect is able to be obtained with less than 10 iterations using the improved method. The segmentation tests for synthesized, biological and medical images prove that the present method is very quick and robust.

PSuB-46

Optimal PID Controllers with Fuzzy Logic for DC Motor

Shengxue Tang1, Yigang He1, Hongmin Li1, Ziyou Tan2
1.Hunan University, China
2.Jishou University, China

In this paper, we present a novel methodology to design proportional–integral–derivative (PID) controllers with fuzzy logic tuning its parameters for the control loop of the DC motor systems. The conventional PID controllers and fuzzy inference systems are investigated and integrated into the fuzzy PID controllers with the proposed method. The advantage of fuzzy logic control is that it does not require a mathematical model of the system and the rules can be gained by experiences and simulation. To obtain the optimal performance of the proposed controller, genetic algorithms are used to tune the scaling coefficients, shape of the membership functions and the basic coefficients. Computer simulation results shows that the fuzzy PID controller is to perform better than the traditional PID controller.

PSuB-47

Study on Modeling and Simulation of Ultra-Low-Power and High-Frequency Digitally Controlled Buck Converter

GUO Shuibao1,2, GAO Yanxia1, LI Nan1, Xuefang Lin-Shi2, Bruno Allard2
1.Shanghai University, China
2.Institut National des Sciences Appliquées de Lyon, France

Digital control is a new trend of Switching Mode Power Supply (SMPS) development. Thus, essentials how to construct the proper model and simulate the function of a full digitally controlled SMPS should be resolved before its realization. This paper has described the design of modeling and simulation for an ultra-low-power and high-frequency digital controlled Buck converter. The converter is represented as a hybrid system with three modes of operation. Digital PID control law is used to regulate the voltage output of Buck converter. Key problems such as quantization resolution and limit cycling in digital controlled DC-DC converter are discussed, and the corresponding solutions are presented. Simulations of a digital controlled buck converter are implemented by Matlab/Simulink tools in fixed-point algorithmic calculation. Simulations results demonstrate this approach enables high-speed dynamic response and programmable ability of the controller without external passive components. Structure and algorithm of the proposed controller can be modified or transferred to meet other requirements easily with flexibility.

PSuB-48

The Property Analysis and System Realizing of a Large Delay System for the Material Balance Process

WuShan Cheng, YinHua Yang
Shanghai University of Engineering Science, China

In this paper, based on the properties of the long time delay and time-varying of the material balance process, the adaptive genetic neural network is proposed to predict and adjust the level of the mixing tank, which is tightly coupled with the sinter ore quality. Adaptive probabilities of crossover and mutation must be applied in genetic algorithms for optimizing the weight of neural network in off-line, and the neural network with LM(Levenberg－Marguardt) inherited from the principle of back propagation is used to train the map parameters and improve the system precision in each sampling period on-line. The results obtained from the actual process demonstrate that the performance and capability of the proposed system are quick respondent and better generalized energy.

PSuB-49

Hybrid Ant Colony Algorithm Clustering Algorithm

Shang Gao1,2, Lei Zhang1, Fengting Zhuang1, Chunxian Zhang1
1.Jiangsu University of Science and Technology, China
2.Soochow University, China

The known mathematical model for clustering problems is given in this paper, with the K-Means algorithm, the simulated annealing algorithm and the ant colony algorithm used as possible solutions to them. The advantages and shortages of K-Means algorithm, simulated annealing algorithm and the ant colony algorithm are then analyzed, so that effectiveness of the hybrid ant colony algorithm would be illustrated through results.

PSuB-50

Detecting Analysis of Infrared Target Based on Grey System and Neural Network

Zhang Heng
Harbin Engineering University, China

A system is developed to analyze the characteristic of infrared object. In this paper, we propose improved entropy of the image to estimate the gray scale of the pixel. It carries on gray scale estimating for constructing the neural networks. And then the grey relational analysis and grey clustering methods are applied to filter the possible object. We predicted the target through the image segmentation pretreatment based on the forecasting value by grey system and assigned corresponding mark to them. The forecasting precision is greatly elevated by GM (1, 1) model. The analysis and the experimental results show that the system has good recognition rate for infrared target.

Poster Session 3
14:30 – 15:30

PSuC-1

New Delay-dependent Global Asymptotic Stability Condition of Hopfield Neural Networks with Delays

Degang Yang1,2
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2.Chongqing University, China

In this paper, the global asymptotic stability of Hopfield neural networks with delays is investigated. Distinct difference from other analytical approaches lies in transforming to an equivalent system by using a parameterized transformation which allows free variables in operator. By utilizing Lyapunov theory and matrix inequality framework, a novel less conservative and restrictive criterion than those established in the earlier references is given in terms of several matrix inequalities. The results are related to the size of delays. Numerical example is given to show the effectiveness of our proposed method.

PSuC-2

Research on Automatic Abstracting Based on Natural Language Understanding

Qinglin Guo
North China Electric Power University, China

A method of realization of Automatic Abstracting based on Natural Language Understanding is brought forward, aimed at overcoming shortages of some current methods. The method makes use of Natural Language Understanding and can realize Automatic Abstracting of multi- documents. The algorithm of twice Word Segmentation based on the Title and First-Sentences in Paragraphs is brought forward. Its precision and recall is above 95%. For a specific domain on plastics, an Automatic Abstracting system named TCAAS is implemented. The precision and recall of multi-document's Automatic Abstracting is above 75%. And experiments do prove that it is feasible to use the method to develop a domain Automatic Abstracting System, which is valuable for further study in more depth.

PSuC-3

Research on the Question Answer System based on Natural Language Understanding

Qinglin Guo
North China Electric Power University, China

Automatic Question Answer System (QAS) is a kind of high-powered software system based on Internet. Its key technology is the interrelated technology based on natural language understanding, including the construction of knowledge base and corpus, the Word Segmentation and POS Tagging of text, the Grammatical Analysis and Semantic Analysis of sentences etc. This thesis dissertated mainly the denotation of knowledge-information based on semantic network in QAS, the stochastic syntax-parse model named LSF of knowledge-information in QAS, the structure and constitution of QAS. And the LSF model parameters were exercised; it proved that they are feasible. At the same time, through “the limited-domain QAS” which was exploited for banks by us, these technologies are proved effective and propagable.

PSuC-4

A Variable Step Size LMS Algorithm and Simulation Research on Gene Prediction

Baoshan Ma, YiSheng Zhu
Dalian Maritime University, China

The techniques based on Digital Signal Processing (DSP) have been applied to analyze the DNA sequence. According to period-3 behavior of protein coding regions, the Least Mean Squares (LMS) adaptive algorithm was proposed to predict the exons in a DNA sequence. The prediction curve of exons was obtained with the standard (fixed step size) LMS algorithm. In terms of the existing questions of the standard LMS algorithm for gene identification, a variable step size LMS (VSSLMS) algorithm was schemed. The simulation results show that the VSSLMS algorithm overcomes the existing defects and is better than the standard LMS algorithm for gene prediction.

PSuC-5

Blood Flow Analysis by Using Spectral Element Method

Usik Lee, Bosung Seo, Injoon Jang
Inha University, Korea

It has been well-known that the blood flow characteristics are closely related to various cardiovascular diseases. Thus it is important to predict blood flow characteristics very accurate enough in an efficient way. To that end, this paper proposes a one-dimensional spectral element model for human blood vessels. The spectral element model is formulated by using the frequency-dependent interpolation functions determined from wave solutions analytically solved to satisfy governing equations in the frequency-domain. The spectral finite element model is then applied to a uniform blood vessel to investigate the blood flow rate and blood pressure through the blood vessel.

PSuC-6

The Fuzzy Data Mining Method in Predicting the Time Series Data

Zuohua Miao
Wuhan University of Science and Technology, China

Although data mining is a relatively young technique, it has been used in a wide range of problem domains during the past few decades. In this paper, the authors present a new model that applies the data mining technique to forecasting the demand for cultivated land. The new model is called the fuzzy Markov chain model with weights. It applies data mining techniques to extract useful information from the enormous quantities of historical data and then applies the fuzzy sequential cluster method to set up the dissimilitude fuzzy clustering sections. The new model regards the standardized self-correlative coefficients as weights based on the special characteristics of correlation among the historical stochastic variables. The transition probabilities matrix of the new model is obtained by using fuzzy logic theory and statistical analysis. The experimental results show that the ameliorative model, combined with the technique of data mining, is more scientific and practical than traditional predictive models.

PSuC-7

Improved Criterion for Global Asymptotic Stability of Delayed Cellular Neural Networks

Kaiyu Liu1, Hongqiang Zhang2
1.Hunan University, China
2.Changsha University of Science and Technolog, China

In this paper, we derive improved criterion for the global asymptotic stability and uniqueness of the equilibrium point of a class of delayed cellular neural networks(CNNs). This result is also compared with the previous results given in the literature.

PSuC-8

Research and Development Expense Estimation of Missiles Based on Genetic Evaluative Algorithm and Artificial Neural Network

Limin Zhang1,3, Geng Peng2, Jianfu Teng3
1.Naval Aeronautical Engineering Institute, China
2.National University of Defense Technology, China
3.Tianjin University, China

Scientific and proper estimation of research and development (R&D) expense on weapons and equipments is an effective means of increasing service efficiency for national defense expenditure. Facing present physical circumstance and existing evaluation methods, this paper provides a new model for estimating R&D expense of equipments (missiles as example) based on genetic evaluative algorithm and artificial neural network (NN). By sufficiently utilizing global optimization search capability of genetic evaluative algorithm and unique advantages of artificial NN in solving nonlinear problems, the model not only gains higher precision than others, but also has many merits, such as high rapidity of convergence, etc. Experimental results indicate that this model is practical and applicable.

PSuC-9

A Novel Method Based on Case-based Reasoning for Retail Customer Segmentation in a Business Bank

Guo Cao1, Rui zhu Han1, Jie Cao1,2
1.Southeast University, China
2.Academy of Mathematics and Systems Science, CAS, China

In this study, we propose a hybrid method of memory and analytic network process (MANP) based on case-based reasoning. In this method, the index weight will be elicited by analytic network process, thus improving retrieval accuracy of case-based reasoning. Then, the function of the similarity is defined to ensure the customers in the same cluster have the closest purchasing patterns. Using a data set concerning a business bank, an experiment is conducted to evaluate the quality and validity of the proposed approach.

PSuC-10

Improvement on Particle Swarm Optimization Algorithm

Wei Wang, Li Peng
Southern Yangtze University, China

Particle swarm optimization (PSO) algorithm is a highly efficient parallel search algorithm. But it is easy to fall into local optimization, and its convergence speed is lower and the precision is worse in the late evolution. Furthermore, the selection of its parameters has enormous impact on the performance of algorithms. Aimed at these disadvantages of particle swarm optimization, adjusting adaptively and nonlinearly method of parameters in PSO, using S-function, is presented in this paper. The improved method tested by functions Shaffer's F6 and LevyNo.5 has a better performance in global searching ability than the method using linearly adjusting parameters.

PSuC-11

Constrained Optimization via Particle Swarm Optimization with Adaptive Inertia Weight Adjust

Wang Cheng, Li Jian
Huazhong University of Science & Technology, China

The particle swarm optimization (PSO) algorithm has been reported to be effective to solve constrained optimization problems. But in the real world, it is hard to select a proper inertial weight for PSO in advance, which affects the performance of PSO much, because it depends on the problems. To address the problem, this paper introduced an adaptive inertia weight adjust operator, where the particles are divided into some groups, which search solutions with various inertial weights. The inertial weights are adjusted adaptively by comparing the movement of particles in each group to strike a balance between global exploration and local exploitation. Besides which, a Gaussian mutation is adopted to enhance the local exploitation. The operators are implemented to the particle evolutionary swarm optimization (PESO), a modified PSO with a differential evolution operator and a mutation operator. By comparison with other PSO methods, PESO with the proposed operators performs better for the constrained optimization problems.

PSuC-12

The Iterative Learning Control for the Stabilization of Wheeled Mobile Robot

Sheng Li, Yiqing Wang, Qingwei Chen, Weili Hu
Nanjing University of Science and Technology, China

In this paper, a control strategy based on iterative learning method and switch control is proposed for the stabilization of wheeled mobile robot with four wheels. The proposed method can stabilize the given system from an arbitrary initial configuration to the origin by switching between two inputs at time sequences. And the control input and the switching time can be obtained through the proposed iterative learning method. Finally, a numerical example and simulation results show the effectiveness of the proposed method.

PSuC-13

Efficient Stochastic Collision Detection For Cloth Simulation using Clustering Based PSO Algorithm

Wang Yi1, Wenhui Li1, Chengzhu Han2, Sen Zhao1, Zhenhua Zhang2
1.Jilin University, China
2.No.240 Institute of 91550 Troops, China

This paper has proposed an efficient stochastic collision detection method for cloth simulation by using Clustering Based Particle Swarm Optimization (CBPSO) algorithm. In the main detection process, particles search for local minimal as active pairs, then active pairs recursively track the neighbours to insure high detection ratio. In order to handle dynamic environment problem caused by models' deformation, an update process is added to PSO in the beginning of every time step. Moreover, with the AABB hierarchy, collision detection performance is speeded up by pruning collision tests between primitives those are too far to collide. At last, we give the precision and efficiency evaluation about the algorithm and find it might be a reasonable choice for real-time cloth simulation.

PSuC-14

General Methods to Transform Unreliable Scores of Predicted Exons to Probabilistic Scores

Qing'an Ren, Xiao Li, Yang Weng, Yunmin Zhu, Yizheng Zhang
Sichuan University, China

The ab initio gene-finding programs play an important role in genome projects. Many of them, especially for leading programs, have developed score schemes for their predicted exons. The meaningful and reliable exon scores that are from the output of the those programs are significant for users, they not only give the users a highly informative guide as to the degree of confidence that the predicted exon is correct, but also provide weights how to combine outputs from several programs to get higher accuracy. However, only a few gene-finding programs provide reliable and meaningful exon scores on relatively short genomic sequences, furthermore, there is not general transformation method for the gene-finding programs. We use three general curve-fitting methods, the

method of Mean Value, Kernel Method and Local Polynomial Regression, to transform exon scores predicted by three leading gene-finding programs on the HMR195 sequence dataset and four leading gene-finding programs on large genomic sequences to probabilistic scores, those three transformation methods all get satisfied results, especially, the LPR gets the best results under most conditions.

PSuC-15

A Propositional Calculus Formal Deductive System UBL of Universal Logic

Minxia Luo1, Huacan He2
1.China Jiliang University, China
2.Northwestern Polytechnical University, China

In this paper, we introduce a kind of algebras UBL-algebra based on the 0-level universal operation of universal logic. A general propositional calculus formal system UBL based onUBL-algebra is built up, and its completeness is proved. It is proved that Lukasiewicz logic and Godel logic are extension of universal logic UBL respectively.

PSuC-16

Compromise Criterion for SVM Model Selection and Training: in Multi-Relational Context

Ping Ling1,2, Chun-guang Zhou1
1.Jilin University, China
2.Xuzhou Normal University, China

This paper creates a SVM schema for Multi-Relational data. It consists of a flexible Kernel frame for capturing MR data structure; local learning strategies for the parameterization of Kernel scales and SVM penalty coefficients; and most important, a compromise criterion for measuring classifier generalization performance, which is used to train SVM and select Kernel frame model. The proposed criterion is the balance of theoretic criterion and empirical criterion, to produce a tight bound on generalization error estimate. Comparisons with the state-of-the-art demonstrate fine performance of the Kernel frame and the SVM compromise-criterion-based.

PSuC-17

Research on a Novel Multi Agents for Decision Making Model

Weijin Jiang1, Pu Wang2
1.Hunan business college, China
2.Business School of Central South University, China

The use of multiple intelligent agents in the decision support systems has become common. However, there are many questions in this field, such as the consensus of the agents and the method on choosing the best decision. In order to solve these problems, this paper provides a method, which uses the fuzzy aggregation operator to aggregate the opinions of the agents, ranks the alterative with the fuzzy preference relations, and then chooses the best alternative. This approach can be widely used in many fields.

PSuC-18

The Applying of improved BP Neural Network on Torpedo Target Recognition

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2.Dalian naval academy, China

In modern naval warfare, the threat of torpedo to the ship has becomes more and more great. The survival probability of surface ship could be very low after wire-guided system and backwash homing torpedo have come into service recently. In the anti-torpedo operation, the countermeasure's validity and pertinence can be improved, if we can distinguish different type of torpedoes exactly and timely after detecting it. Then we can take actions against guidance mode effectively. According to the characteristics of different guidance modes of torpedo when attack surface ship, the paper demonstrates the feasibility to recognize and classify torpedoes with applying BP neural network by establishing recognition model to judge the type of the attacking torpedo. The result can meet the need of operational desire in principle after testing the network.

PSuC-19

A Scalable Secret Image Sharing Method Based on Discrete Wavelet Transform

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This paper presents a scalable secure scheme for sharing and hiding secret image. The given secret image is firstly divided into numerous non-overlapping blocks, and then transformed each block into wavelet frequency by one-level discrete wavelet transform. Second, quantization the wavelet coefficients into 256 gray level. Third, a bit-plane scanning method rearranges the gray value information of the quantized image. Four, share the rearranged image into n shadows by using multiple thresholds. Five, conceal each shadow image in R, G and B channels of the cover image, which doesn't attract Attracters' attention. Six, the more shadows the better quality of the retrieved secret image. The experimental results show that the retrieved secret image presents higher visual quality and the stego-images present better invisibility than traditional methods.

PSuC-20

Study on Fault Feature Extraction of Vessel Propulsion Plant Condensator Based on Principal Component Analysis

Sheng Liu, Na Jiang
Harbin Engineering University, China

In pattern recognition, the extraction of fault features is very important. In this paper, an algorithm —Principal Component Analysis (PCA) for feature extraction was introduced in detailed. By reducing its dimensions through matrix conversion in the PCA algorithm, the fault feature of condensator in vessel propulsion plant was extracted. It provided an effectively feasible data preprocessing method for the vessel propulsion plant fault diagnosis and fault

prediction.

PSuC-21

Using Log-domain Wavelet Transform Circuits for Cardiac Signal Characterization

Li Hong-min1,2, He Yi-gang1, Zhang Guo-yun2
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2.Hunan Institute of Science and Technology, China

For applications requiring low-power and real-time in implantable medical devices such as pacemakers, a novel method for detecting QRS of cardiac signal based on log-domain continuous wavelet transform analog VLSI is presented. To implement the WT in an analog way, the first derivative of the Gaussian wavelet is approximated using Levenbery -Marquardt least square method. The designed circuits of implementing WT are composed of analog filters, whose impulse response are the required wavelet .The filters design are based on balanced log-domain integrators. By using the modulus maxima in the WT implemented by the circuits, QRS complex can be successfully distinguished. And the validity of the proposed method is confirmed by simulation results.

PSuC-22

Online State-Space Model Based Chaotic Time-Series Prediction

Xuedong Wu1,2, Xinhua Jiang1, Zhihuan Song2
1.Fujian University of Technology, China
2.Zhejiang University, China

The state of the system is given by the weight parameters of the network, and the measurement equation represents as a nonlinear function of the weight vector and the input vector to the network. A nonlinear model of chaotic time-series prediction approach using a state-space multilayer perceptron (MLP) is considered in this paper. The Unscented Kalman filter (UKF) and extended Kalman filter (EKF), which is fit for state-space representation, is employed to train the MLP. The simulation experimental study is presented to compare the performance of MLP-UKF and MLP-EKF for Mackey-Glass time-series prediction. Simulation results of the MLP-UKF and MLP-EKF with synthetic data prove that MLP-EKF is a better choice for Mackey-Glass time-series prediction due to the linear nature of the state equation.

PSuC-23

Study on Improvement of Text Classification Resolution

Ziye Li, Yagang Wang, Ju-e Guo, Youmin Xi
Xi'an Jiaotong University, China

In the practice of text classification, resolution is a very important performance index which determines the effect of classification. At present, close degree of fuzzy sets is used broadly as an intuitionistic and effective rule of classification. However, practice shows us that, the resolution of contextual data is getting worse and worse when the quantity of elements in fuzzy set grows. Aiming at solving this problem, we establish a new calculation model of close degree between fuzzy sets, and prove its ability of controlling instability and reinforcing stability. At the same time, the example shows that the new model could improve resolution effectively.

PSuC-24

A Novel Adaptive Control Algorithm based on Nonlinear Laguerre-Volterra Observer

Hai-Tao Zhang
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By expanding each kernels using rthonormal Laguerre series, a Volterra functional series is used to represent the input-output relation of a nonlinear dynamic system. When Volterra series and Laguerre series truncations are allowed, an appropriate choice of the Laguerre filter pole permits a description of the process dynamics with a small number of parameters. Feeding back the error of the outputs of the plant and the model, we design a novel nonlinear state observer, based on which a stable output feedback control law is derived for both regulator and tracking problems. To support this algorithm, we present the theoretical analyses of its nominal stability, which allows obtaining the state feedback gain and the observer gain solely by solving two LMIs (linear matrix inequalities). In addition, another theorem is also given to show its capability of minimizing the steady-state tracking errors. For handling more complex dynamics, we improve the standard RLSE (recursive least square estimation) identification method to a normalized one with guaranteed convergence. Finally, control simulations on a benchmark problem-CSTR (continuous stirring tank reactor) process and experiments on a chemical reactor temperature control system are performed. This method, especially its essential idea of Volterra nonlinear observer, has shown the great potential for the control of a large class of nonlinear dynamic systems.

PSuC-25

The Research of Multi-agent Architecture Based on Artificial Immune System

Xiang Zhao, Houkuan Huang，Zhifeng Wu, Ying Zhang
Beijing Jiaotong University, China

The artificial immune system and multi-agents learning have been studied for many years .The artificial immune system is a complex system of tissues, cells, molecules that can provide primary defense against pathogenic organisms for us. These components of the system are highly interactive and execute the immune response in a coordinated and specific manner. The coordination and distribution is the role capability of multi-agents. In this paper, we introduce the artificial immune system used in the multi-agent, and discuss the advantage and disadvantage of this method. Further more, we expect the future of multi-agents architecture based on AIS

PSuC-26

Mathematical Foundation on Algorithms of Fuzzy Reasoning

Zhenghua Pan
Southern Yangtze University, China

Various algorithms of fuzzy reasoning are essentially computation conclusion from premise, its subjectivity is

stronger and theoretical basis is poor, thus a number of scholars doubted its soundness theoretically. This paper studies the structure of algorithms of fuzzy reasoning, the basic idea of algorithm of fuzzy reasoning is to construct varying collective rules of inference described with inference schema and to turn it into one fuzzy relation between variables, so they are essentially the one of determining of fuzzy relation; the conclusion has been reached by various algorithms is the result that the premises conditions have been computed by three basic operators $t\wedge$ (t-module), $t\vee$ (t-complement) module and tc (complementary) on [0,1]. Moreover, three theorems are proposed and proved. These theorems show that there always exists a mathematical relation (that is, a bounded real function) between the premises and the conclusion for fuzzy reasoning, and in fact various algorithms of fuzzy reasoning are specific forms of this function. Thus these results show that algorithms of fuzzy reasoning are reliable theoretically.

PSuC-27

Solving Nonlinear Equations Based on Chaos Theory: Method and Application in Engineering

Jin Cheng, Zhen Y. Liu, Jian R. Tan
Zhejiang University, China

The purpose of this study is to explore a simple approach for fast locating all the roots of nonlinear equations utilizing the chaotic property of Newton's iteration. A thorough theoretical analysis of the complex Newton method reveals that the critical points of a nonlinear equation are the simplest Julia points of its Newton dynamical system and that sampling in some complex vicinities of a critical point ensures the location of all the roots. A chaotic algorithm for fast solving nonlinear equations is proposed, which first finds a critical point of the nonlinear function, and then samples enough points in the complex vicinity of the critical point and utilizes them as the initial points for Newton's iteration to locate all the roots. The algorithm also applies to two-variable systems of real nonlinear equations satisfying Cauchy-Riemann equations since they can be expressed as complex nonlinear equations. The successful application of our algorithm in the synthesis of four-bar planar mechanism demonstrates that it is effective, feasible and applicable for solving practical engineering-oriented problems.

PSuC-28

An Adaptive Fusion Algorithm Based on ANFIS for Radar/Infrared Measurement

Qing Wang, Quan Yuan, Chaoyang Dong
Beihang University, China

In order to improve tracking ability, an adaptive fusion algorithm based on adaptive-network-based fuzzy inference system (ANFIS) for radar/infrared sensor measurement is proposed, which combines the merits of fuzzy logic and neural network. Fuzzy adaptive fusion algorithm is a powerful tool to make the actual value of the residual covariance consistent with its theoretical value. To overcome the defect of the dependence on the knowledge of the process and measurement noise statistics of Kalman filter, neural network is introduced, which has the ability to learn from examples and extract the statistical properties of the examples during the training sessions. The fusion system mainly consists of Kalman filter, ANFIS sensor confidence estimator (ASCE) based on contextual information (CI) theory, knowledge base (KB) and track-to-track fusion algorithms. Simulation results show that the algorithm can effectively adjust the system to adapt contextual changes and has strong fusion capability in resisting uncertain information.

PSuC-29

Research on CGF Behavior Modeling of Environment Sensation and Decision Making

Xiao Song, Guanghong Gong
Beijing University of Aeronautics and Astronautics, China

In this paper recent CGF behavior modeling research fruits gained by authors are presented. A type of CGF behavior model structure is introduced. The authors propose that a CGF entity behavior model can be divided into three parts, general battlefield behavior model, environment sensation model and reasoning & decision model. Compared to traditional environment sensation model which gets information from simulation visualization system, a new kind of battlefield environment sensation model is discussed in detail. It overcomes shortcomings of low efficiency in environmental information retrieve. And a sort of fuzzy reasoning decision model of the behavior model is studied detailedly and a path plan example is presented. An application example of a land army armor CGF system is introduced and the detailed environment sensation and reasoning process is discussed.

PSuC-30

Quality Determination of Fruit Vinegar Using Spectroscopic Technique Based on PLS and LS-SVM Algorithm Model

Yong He, Li Wang
Zhejiang University, China

Vinegar made of fruit is a fashion and healthy beverage in the world now, but traditional measurement used to detect the internal quality of fruit vinegar was inefficiently. For the fast and exact detection of soluble solid content (SSC) and pH in fruit vinegar, near infrared spectroscopic (NIRS) technique combined with least squares support vector machines (LS-SVM) algorithm were used to build the detected model in this research. The near infrared transmittance spectra of three hundred samples were obtained using NIR spectroradiometer, then, partial least squares (PLS) was applied for reducing the dimensionality of the original spectra, 6 latent variables (LVs) were selected. The 6 LVs could be used to replace the complex spectral data. The three hundred samples were randomly separated into calibration set and validation set. And LS-SVM algorithm was used to build calibration model of SSC and pH, then the model was employed for the prediction of the validation set. Root mean square error prediction (RMSEP) and correlation coefficient (r) of prediction were used as the evaluation standards, and the results indicated that the RMSEP and r for the prediction of

SSC were 0.2889 and 0.9963; while 0.0357 and 0.9943 for pH. Hence PLS and LS-SVM algorithm model with high prediction precision could be applied to the determination of SSC and pH in fruit vinegar.

PSuC-31

Multiobjective Optimization using SPEA2+: Application to the Design of Hydraulic Presser

Wei Wei, Yixiong Feng, Jianrong Tan, Wei Zhe
Zhejiang University, China

In this paper, three primary objective functions of hydraulic presser were established, namely, the nominal pressure rating (Pm), the fully loaded power (Nm) and the oil injection volume (Qm). An improved strength pareto evolutionary algorithm (SPEA2+) was employed to optimize these objectives simultaneously. The results were compared with those obtained by SPEA2 and NSGA-II. Results of the analyses indicated that SPEA2+ has better robustness and convergence than SPEA2 and NSGA-II, and could generate uniformly a Pareto optimal set in the design space. Furthermore, an instance related with the project in the machine industry was given to prove the feasibility and validity of the proposed technology.

PSuC-32

Pattern Based on Object-Oriented Design for Computer Cell Models

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2.University of Manchester, UK

Construction of biophysically detailed computer models for the electrical activity of cardiac system provides a power tool to systematically investigate the ionic mechanisms underlying the genesis and control of cardiac rhythms. However, the fact that there is no unified or standard architecture for the computational cell models, which were built by different groups with programming languages, obstructed profound applications of these models. In this study, we use object-oriented methods with design patterns to redesign and reconstitute the cell models and provide a more flexible, portable, and expansible infrastructure for the development and application of computational cell models. The infrastructure not only allows more efficient applications of the current cell models at cellular, tissue and organ levels, but also supports future re-engineering new models or updating the existing models.

PSuC-33

A Bionic Approach to Product Technology Maturity Evaluation

Bin He, Minglun Fang, Qingfeng Yuan
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How to evaluate evolutionary products in a product family with a bionic view is a challenging issue. This paper is devoted to presenting a bionic and computational approach to evaluate the product technology maturity in product evolutionary design. A model of product evolutionary tree describing product evolutionary process is proposed. An evaluation method of product technology maturity based on product evolutionary tree is then put forward. The product evolutionary design process is also present. The evolution of electrical bicycles and the analysis of corresponding technology maturities are given as an example, which demonstrates that the methodology is obviously helpful to the research and development (R&D) strategy planning for corporations, the examination and approval of R&D projects for government divisions, and product R&D for designers.

PSuC-34

Web-Based Domain Ontology Learning Model and Ontology Construction

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2.Dalian Polytechnic University, China

Most ontology applications need appropriate, highly efficient method for ontology construction. Although many remarkable progresses appear in the ontology building methods based on web resources, they still encounter lots of difficulties, for example, the Web data extraction and knowledge acquisition. On the basis of the characteristics of ontology construction data, including dynamics, largeness, variation and openness and other features, this study focus on the fundamental issue of ontology construction, i.e. formalized representation method, and proposed a software model — OntoMaker (Ontology Maker). OntoMaker is innovative in two aspects: one is the improvement of generality, namely, the meta learning machine will dynamically pick appropriate ontology learning methodologies for data in different domains; the other is the merged processing of (semi-) structural and non-structural data. To verify the performance of the Onto-Maker, we apply this method into wetland study and construct a wetland ontology, and the result is very promising.

PSuC-35

Density-based Sampling Technique for Privacy Preserving Clustering

Dianmin Yue1, Xiaodan Wu1, Chao-Hsien Chu2, Fengli Liu1
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2.Pennsylvania State University, USA

The sharing of data has been proven beneficial in data mining applications. However, privacy regulations and other privacy concerns may prevent data owners from sharing information for data analysis. To resolve this challenging problem, data owners must design a solution that meets privacy requirements and guarantees valid data clustering results. To achieve this dual goal, we introduce a new method for privacy-preserving clustering based on the density-based sampling model for clustering. This paper proposes square wave-based clustering model (SWCM) and gauss distribution-based clustering model (GDCM) based on the information provided by the K-means clustering result separately. And we mainly show the correctness and feasibility of the sampled data for clustering by experiment. This new preserving technique

can be used not only for distributed clustering, but also for simultaneous clustering rule and data hiding.

PSuC-36

The Modeling mechanism of GNNM (1,1,t) and Its Application

Junfeng Li1, Aiping Yang2, Wenzhan Dai1, Haipeng Pan1
1.Zhejiang Sci-Tech University, China
2.Zhejiang University of Finance & Economics, China

Based on the amalgamation of grey GM(1,1,t) model and forward neural network, the grey neural network(GNNM(1,1,t)) is put forward. Moreover, the relationship among parameters and neural networks' weights is presented, the learning algorithm of the GNNM(1,1,t) is also given . Because the learning error of the GNNM(1,1,t) can be controlled effectively, the model's precision can be greatly improved . At last, the grey neural network is used to build the model of Chinese per-yield of voile and the results show the effectiveness of the GNNM(1,1,t).

PSuC-37

Initial Parameter Optimization for DOT Based on Evolution Strategy

Hua Zhang, Xiyun Feng, Fan Sun, Yanbin Xue
Tianjin University of Technology, China

A novel, evolution-strategy-based optimization scheme for determining initial parameters in diffuse optical tomography is presented in this paper. The scheme has been tested and evaluated by using numerical simulation and phantom experiment data. These testing results indicate that the ES optimization scheme can fast, effectively evaluate the initial parameters that are required in DOT image reconstruction, just based on the measurement data.

PSuC-38

A Fast Dimensionality Reduction Algorithm for Time Series Representation

Shiyuan Liu, Hao Jiang, Tielin Shi, Guanglan Liao
Huazhong University of Science and Technology, China

In the similarity search of time series, the definition of similarity measurement and the computation complexity of the dimensionality reduction algorithm determine the result and efficiency of the search. This paper presents a uniform concept to model the time series similarity problem, including a similarity function and a transform function. A novel Top_Down algorithm for time series representation based on local extrema feature extraction is proposed. This method pays more attention to the local features and achieves high compression ratio of the series so as to meet the requirement of fast time series search without smoothing the local features of the original series. The new algorithm is implemented and compared with other methods, and its validity and efficiency are verified. A probing method of ensemble index is proposed and discussed at the end of this paper.

PSuC-39

Research on Application of Ant Colony Algorithm in Hydrophobic Image Processing of Insulators

Liangrui Tang, Bing Qi, Chunhui Zhao, Jun Lu
North China Electric Power University, China

Ant colony algorithm (ACA) is a kind of discrete, parallel and robust evolutionary algorithm. Considering the characteristics of hydrophobic images, ACA is proposed to for t-he feature extraction of hydrophobic images. Firstly, image intensifying is obtained by self-adaptive histogram equalization. Then, according to changes of gray value and grade value, perceptual graph is built based on ACA to represent the connections between neighborhoods in hydrophobic images. Finally, image feature extraction is achieved by the information of perceptual graph. Experimental results illustrate that this algorithm is efficient to hydrophobic images processing.

PSuC-40

Feature Subset Selection and Parameters Optimization using GA for SVR on Short-term Load Forecasting

Songxue Li1, Zhongchun Mi1, Jinfeng Fan2, Chenxi Shao1
1.USTC, China
2.Anhui Electric Power Research Institute, China

Support Vector Machines (SVM) model has been popularly used in the short-term load forecasting (STLF) because of its good generalization performance and high forecasting accuracy. The feature selection and the kernel parameters setting for SVM in a training process are crucial factors that impact on the forecasting accuracy and one of the two operations influence the other. In this study, Genetic Algorithms (GA) is proposed to determine the optimal feature subset and the best parameters of Support Vector Regression (SVR) simultaneously. Subsequently, the proposed GA-SVR model was tested on the regional load forecasting in Anhui province to compare the accuracy of SVR. Experimental results show that the GA-SVR model performs the better forecasting accuracy.

PSuC-41

Research on Query Expansion based on User Relevance Feedback and Ontolog

Ming Li, Junquan Li
Lanzhou University of Technology, China

In information retrieval system, Query expansion is one of the important research topics. In order to improve the performance of information retrieval systems, a novel method for query expansion is presented in this paper. The proposed method is a hybrid QE technology that combines user relevance feedback and ontologies. FirteX, which is the first open source information retrieval experimental platform in our country is used as our experimental platform. We compared the proposed method with cosine similarity-based QE which is a widely used query expansion technique. The experimental results show that the proposed method outperforms cosine similarity-based QE 15% and 13% in terms of average precision and average recall and has an improvement of 16% in F-measure.

PSuC-42

A Network Risk Evaluation Paradigm Based on Danger Theory

Lingxi Peng1,2, Tao Li1, Hui Zhao1, Caiming Liu1, Jinquan Zeng1, Yang Cheng1
1.Sichuan University, China
2.Guangdong Ocean University, China

Network Risk Evaluation is the pivotal technology of building the next generation active defensible network, which has been got widespread concerns by experts and scholars. To effectively evaluate the risk of network, a network risk evaluation paradigm based on danger theory, referred to as Nepad, is proposed. With the definitions of self, non-self, and detector, the intrusion detection sub-model is given, which is composed of memory detectors, mature detectors, and immature detectors. Then, the danger theory based network risk evaluation sub-model is given. In our model, each type of network attack, including holistic risk of the host and network, can be calculated in real time and quantificationally. Both the theory analysis and experimental results show that Nepad provides an effective and novel approach for network risk evaluation.

PSuC-43

Collaboration of Teleoperated Multiple Humanoid Robots

Muhammad Usman keerio, Altaf Hussain Rajpar, Attaullah Khawaja, Ali Raza Jafri
Beijing Institute of Technology, China

The purpose of this paper is to design an easy manageable multiple humanoid robots teleoperation system for torch passing. The difficulty of the collaboration lies on the fact that each position shifts with the other's while they are moving. Therefore, it is necessary to correct the position in a real-time. In this paper, collaborative problem of two humanoid robots is described using leader-follower type control for the torch passing real time teleoperation. It can be applied on multiple humanoid robots in parallel executed processes. Torch passing collaboration for two humanoid robots is based on computer control, wireless LAN, robot vision and force feedbacks. The method is applied as key software of the system. Goal is to plan/coordinate the movement of two robots to avoid inter-robot collisions (interference), monitoring critical situations (such as unknown obstacles) and performing real time tasks. The effectiveness of the proposed methodology is discussed.

PSuC-44

Exploring a Multi-feature Based Language Modeling Method for Sentiment Classification

Yi Hu1, Ruzhan Lu1, Yuquan Chen1, Maosheng Zhong1,2
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2.East China Jiaotong University, China

Characterizing the semantic orientation of documents as “favorable (positive)” or “unfavorable (negative)” captures the subtle information in text retrieval. This paper presents a multi-feature based language modeling approach for sentiment classification. It depicts the dependencies between a sensitive concept and features in its context: at first, a batch of sensitive concepts in domain is extracted; then, two different language models representing classifying knowledge are built up from two training collections with positive and negative orientation separately; at last, an evaluating function based on the generation of a test document is defined for sentiment classification. We introduce multi-feature in the last two stages to make our method more effectively. When compared with Support Vector Machine, the language modeling method performs better.

PSuC-45

MCML: an XML-based Modeling Language for Myocardial Cell Electrophysiolog

Kuanquan Wang1, Guosheng Yang1, Yongfeng Yuan1, Henggui Zhang2
1.Harbin Institute of Technology University, China
2.University of Manchester, UK

MCML (Myocardial Cell electrophysiology Modeling Language) has been proposed and designed in this paper. After investigating all myocardial cell electrophysiological models, the general features of myocardial cell architecture are extracted and abstracted. By full use of the compatibility and reliability of XML, MCML has been designed to model myocardial cell electrophysiological activities in effect. In MCML, semantic relevance and aspect dependency provide a guarantee for the integrity of models. It overcomes the shortcomings of traditional descriptions for models and reduces the redundant information.

PSuC-46

Feature Selection Based on SVM and Rough Set and with Application on Oil-Gas Prediction

Nie Ru, Yue Jianhua
China University of Mining and Technology Xuzhou, China

Feature selection is a process that selects a subset of original features. In this paper a new rough set based feature selection approach is proposed in which the feature similarity relation is used. Furthermore, to solve the classification of features the SVM algorithm which the importance of features is evaluated and the procedure of the selection is performed in an iterative way. Finally, the numerical experiments on oil-gas prediction show that our method is feasible and effective.

PSuC-47

A New 3AIG Enterprise Model with the Goal Embedded

Jianfeng Li1, Yijun Li2, Yan Chen1
1.Dalian Maritime University, China
2.Harbin Institution of Technology University, China

Enterprise model has been an important tool to understand business process clearly and make operational alteration properly to adapt today’s competitive environment. This paper brings forward a new kind of enterprise model named 3AIG which includes five important elements: actor, activity, asset, information and goal. In the model, the goal is in strategic position, which is embedded very well. Through the 3AIG enterprise modeling, it‘s in favor of

showing that goal is achieved by the way that actors take activities and deal with information and asset, and advantageous to analyze the operation of enterprise in order to make some adjustment for improving operational efficiency and increasing competitive ability.

PSuC-48

Asymmetry Computing for Cholesteatoma Detection Based on 3-D CT Images

Anping Song, Guangtai Ding, Wu Zhang
Shanghai University, China

Cholesteatoma is a destructive and expanding sac in the middle ear and/or mastoid process. If untreated, cholesteatoma can result in nerve deterioration, deafness, imbalance and vertigo. Traditional diagnose methods rely on doctors' experience and often misdiagnosed. In this paper, we propose a novel asymmetry-computing algorithm for cholesteatoma detection based on 3-D CT images. By applying this algorithm, we provide a complete numerical calculation framework and its simulation. The proposed algorithm is tested on real 3-D eardrum CT images. The diagnose accuracy rate of cholesteatoma is 72.73%, and the misdiagnose rate is only 27.27%. The result demonstrates the applicability of the proposed asymmetry-computing algorithm for cholesteatoma detection. Therefore the proposed algorithm is beneficial for clinic diagnose.

PSuC-49

A Rough Pattern Based Method for Automated Extraction of Conceptual Knowledge from a Chinese Dictionary

Yi Hu1, Ruzhan Lu1, Yuquan Chen1, Maosheng Zhong1,2, Jianyong Duan1
1.Shanghai Jiaotong University, China
2.East China Jiaotong University, China

In this paper, we explore a method based on rough pattern for extracting conceptual knowledge from a Chinese machine-readable dictionary, i.e. the (attribute, value) structure of concepts, involving in part-of, material, function and usage from the corresponding definitions of nominal entries. Our method focuses on constructing rough patterns that do not have accurate extraction semantic and the statistical decision for applying these patterns in different contexts. Therefore our work is designed to be a new procedure. We annotate a few definitions to be used as training data for these four attributes and contextual language features, and then define rough patterns for extracting such conceptual knowledge, and at last learn the applicability of the patterns by classifiers (Support Vector Machine and Naïve Bayes) to decide whether a pattern can be used in current context or not. When applying these patterns with the disambiguating information to the other nominal entries of the dictionary, we achieve relatively satisfying results, and at the same time we compare the two classifiers.

PSuC-50

A Variable Neighborhood Search Algorithm for Uniform Parallel Machine Scheduling With Release Dates

Kai Li, Shanlin Yang, Yu Zhu
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This paper considers the problem of uniform parallel machine scheduling with unequal release dates so as to minimize makespan. This problem is proved to be an NP-hard problem. Existing heuristics for the problem are analyzed, and then we present a heuristic H(α,β) to improve the performance of them. A variable neighborhood search algorithm is developed, in which we use the solution that H(α,β) obtained as initial solution. The use of variable neighborhood search to minimize makespan on uniform parallel machines is proven to be efficient and effective.

Poster Session 4
15:50 – 16:50

PSuD-1

Cellular Modeling and Simulation of Short QT Syndrome

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The short QT syndrome (SQTS) is associated with a high incidence of sudden cardiac death. However, it is still unclear and remains to be further investigated whether borderline shortened QT intervals, bradycardia-associated shortened QT intervals, or fluctuating QT intervals are of clinical significance. In this study, the detailed cellular electrophysiological characteristics of gene mutation-induced changes of cellular ionic channel kinetics on electrical action potentials were modeled according to the experimental findings. Simulation results shown that all the known gene mutations in SQTS led to the gain of function in the repolarizing potassium currents of IKr (KCNH2), IKs (KCNQ1) and IK1 (KCNJ2) resulted in a selective speeding of late repolarization generating non-homogenous APD and refractoriness shortenings within the cardiomyocyte, which may generate a transmural dispersion of the repolarization and thus establish a potential substrate for the development of ventricular tachyarrhythmias and increase vulnerability to sustained ventricle/atrial fibrillation.

PSuD-2

Parametric-expression-based Construction of Interior Features for Tissue Engineering Scaffold with Defect Bone

Chunxiang Dai, Qingxi Hu, Minglun Fang
Shanghai University, China

Constructive features of tissue engineering scaffold with defect bone are defined. And based on the definitions and medical image 3D reconstructions as well as CAD technology, the constructing method for macrostructure of its interior features of tissue engineering scaffold with

defect bone is presented, which is based on parametric expressions. And demonstrations of two constructing methods are given. Finally from calculations of the porosity, the structures of interior features are proven to meet the demand of porosity of tissue engineering scaffold with defect bone.

PSuD-3

Predicting syndrome by NEI specifications: A comparison of five data mining algorithms in Coronary Heart Disease

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1.Chinese Academy of Sciences, China
2.Chinese Academy of Chinese Medical Science, China

Nowadays, most Chinese take a way of integration of TCM and western medicine to heal CHD. However, the relation between them is rarely studied. In this paper, we carry out a clinical epidemiology to collect 102 cases, each of which is a CHD instance confirmed by Coronary Artery Angiography. Moreover, each case is diagnosed by TCM experts as what syndrome and the corresponding nine NEI specifications are measured. We want to explore whether there exist relation between syndrome and NEI specifications. Therefore, we employ five distinct kinds of data mining algorithms: Bayesian model; Neural Network; Support vector machine, Decision trees and logistic regression to perform prediction task and compare their performances. The results indicated that SVM is the best identifier with 90.5% accuracy on the holdout samples. The next is neural network with 88.9% accuracy, higher than Bayesian model with 82.2% counterpart. The decision tree is less worst, 77.9%, logistic regression models performs the worst, only 73.9%. We concluded that there do exist relation between syndrome and western medicine and SVM is the best model for predicting syndrome by NEI specifications.

PSuD-4

Sensitivity Analysis of Influential Factors on Strata Movement Using Neural Network Committee

Maosen Cao1,2,3, Pizhong Qiao1,3
1.Hohai University, China
2.Shandong Agricultural University, China
3.Washington State University, USA

A neural network committee (NNC)-based sensitivity analysis strategy is presented to study sensitivity of influential factors on strata movement. Different from conventional usage of neural network usually acting as a 'black box' to perform prediction, the proposed neural network is applied to reveal or highlight the 'gray' relationships among influential factors on strata movement. The strategy utilizes NNC to estimate the relative contribution of each independent (input) variable on dependent (output) variables so that the instability of conventional single neural network-based sensitivity analysis methods is avoided. The experimental results demonstrate that the NNC–based sensitivity analysis strategy is capable of facilitating the training convergence of neural network and improving its prediction precision on strata movement angle. This strategy is effective in revealing complex relationships underlying in engineering influential factors, and it can be used to develop viable prediction models for complex systems, such as for modeling and simulation of engineering structures and life systems.

PSuD-5

Predicting Corporate Financial Distress Using Rough Set Theory and ACO-Based Support Vector Machine

Jianguo Zhou, Jiming Tian
North China Electric Power University, China

In the analysis of financial distress based on support vector machine (SVM), redundant variables in the samples spoil the performance of the SVM classifier and reduce the recognition accuracy. On the other hand, two SVM parameters, C and σ, must be carefully predetermined in establishing an efficient SVM model. In order to solve the problems mentioned above, this paper used rough sets as a preprocessor of SVM to select a subset of input variables and employed the ant colony optimization algorithm (ACO) to optimize the parameters of SVM. The proposed ACO-SVM model that can automatically determine the optimal parameters was tested on the prediction of financial distress of listed companies in China. Then, we compared the accuracies of the proposed ACO-SVM model with those of other models of multivariate statistics (Fisher and Probit) and artificial intelligence (BPN and fix-SVM). Especially, we adopted bootstrap technology to evaluate the reliability of validation. Experimental results showed that the ACO-SVM model performed the best predictive accuracy and generalization, implying that integrating the ACO with traditional SVM model is very successful.

PSuD-6

An Approach to Building Extraction Based on Two-way Fusion

Taisong Jin1,2, Mingye Liu1, Cuihua Li2
1.Beijing Institute of Technology, China
2.Xiamen University, China

This paper proposed a new approach to extract building regions in natural image fusing the goal-driven, top-down attention and image-driven, bottom-up attention. Based on the truth that previous research has mostly focused on models that are purely top-down or bottom-up, the proposed approach combines both to imitate the process of human vision where the bottom-up component computes the visual salience of scene locations extracted in the image, and the top-down component uses the environment knowledge around the objects to search the target in terms of the bottom-up maps. Testing on the natural scenes shows that the compared with the present methods, the proposed approach is more consistent with a large body of available literature of visual search on human vision, and has the better detection results in complex natural scenes.

PSuD-7

Infrared Dim Small Target Detection and Tracking through Target Enhancement by Using Modified Top-hat Transformation

Xiangzhi Bai1, Fugen Zhou1, Yongchun Xie2, Ting Jin1
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2.Beijing Institute of Control Engineer, China

A new dim small target detection and tracking algorithm in infrared image sequence through target enhancement by using modified top-hat transformation is proposed in this paper. The top-hat transformation is modified according to the property of the target region. Based on the modified top-hat transformation, a target enhancement operation is constructed and used to apparently enhance the dim small target. The proposed algorithm firstly enhances only the potential target regions through the target enhancement operation. Then, the potential target regions are segmented by thresholding operation to generate the binary potential target image. After that, dilation cumulation which is formed following the properties of the target motion is applied to reduce most of the remained false alarms in consecutive binary potential target images. Finally, the target is detected by using the motion property of the target. The target enhancement operation largely enhances the dim small target, which suppresses false alarms and simplifies the target detection and tracking. Experimental results verified the proposed algorithm is effective and robust.

PSuD-8

MATLAB Simulation and Comparison of Zhang Neural Network and Gradient Neural Network for Online Solution of Linear Time-Varying Equations

Yunong Zhang, Ke Chen, Weimu Ma
Sun Yat-Sen University, China

Different from gradient-based neural networks (in short, gradient neural networks), a special kind of recurrent neural networks has recently been proposed by Zhang et al for time-varying matrix inversion and equations solving. As compared to gradient neural networks (GNN), Zhang neural networks (ZNN) are designed based on matrix-valued or vector-valued error functions, instead of scalar-valued error functions based on matrix norm. In addition, Zhang neural networks are depicted in implicit dynamics instead of explicit dynamics. In this paper, we simulate and compare Zhang neural network and gradient neural network for the online solution of linear time-varying equations. To do so, two important MATLAB-simulation techniques are employed. i) MATLAB routine “ode45” with a mass-matrix property is introduced. ii) Matrix derivatives are obtained by using MATLAB routine “diff” and symbolic math toolbox. Computersimulation results substantiate the theoretical analysis of Zhang neural network and gradient neural network for solving linear time-varying equations, especially when using a power-sigmoid activation function. In addition, such neural networks are simulated and compared in the presence of large implementation errors.

PSuD-9

Recognizing Features Based on Neural Network

Rongqing Yi, Wenhui Li, Duo.Wang, Hua Yuan
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This paper presents a novel method to recognize standard, non-standard, and interacting features. A hybrid of graph-based and neural network recognition system is developed. We use feature forest as the heuristic information to recognize the interacting features. The part information is taken from the B-rep solid date library then broken down into sub-graph. Once the sub-graphs are generated, they are first checked to see whether they match with the predefined feature library. If so, a feature vector is assigned to them. Otherwise, feature forest is obtained as heuristic information and used to restore the missing faces, meanwhile, update the sub-graphs. The sub-graphs are transformed into vectors, and these vectors are presented to the neural network, which classifies them into feature classes. The scope of instances variations of predefined feature that can be recognized is very wide.

PSuD-10

Using Logic Relationships to Model Cancer Gene Networks with Gene Expression Profile

Xiaogang Ruan, Jinlian Wang, Hui Li, Qingshuo Li, Xiaoming Li
Beijing University of Technology, China

Analysis of cellular pathways and networks in terms of their logic relationships is important for deciphering the networks of molecular interactions that underlie cellular function. First, a computational approach for identifying gene logic types is presented based on graph coloring theory. Second, the logical relationship between genes was identified using LAPP and applied to the mRNA microarray data of 51 colon cancer oncogenes and suppressor. Third, a colon cancer gene network with directions and weights is constructed. This network contained interactive pathways including mirosatelitte unstable (MSI), transforming growth factor (TGF-beta) signaling pathway whose logic relationships were verified by KEGG pathway database. The results show that this method is feasible for revealing new hidden complicated relationships among colon cancer genes and increasing the reliability of the interpretation of experimental results. Extension of such methods appears to be a fruitful area for developing more powerful bioinformatics tools.

PSuD-11

Research of Revised Residual Error-Ant Colony Optimization Gray Model Based on BP Neural Network in Load Forecasting

Niu Dongxiao, Li Yanchang, Wang Tiegang
North China Electric Power University, China

GM (1,1) forecasting model has the advantages of few sample data, simple principle, easy calculation, high prediction accuracy in short terms, and verifiability, etc. It is extensively applied in the load forecasting. However, it has its limitations. The greater the gray level of data, the lower the prediction precision. Besides, GM is not suitable to long-term forecasting of economy to backstep for years, which, to a certain extent, is caused by parameter a in the model. To solve the problem, vector θ is introduced

to set up residual error GM (1, 1, θ) model, which is solved by the use of Ant Colony Optimization (ACO). In the meanwhile artificial neural network is applied to revise prediction residual error. Case analysis shows that it effectively improves prediction accuracy in comparison with traditional forecasting methods, because various features are considered. Application shows that the proposed method has definite practical value.

PSuD-12

Research of Immune Neural Network Model Based on Extenics

Xiaoyuan Zhu, Yongquan Yu, Hong Wang
Guang Dong University of Technology, China

In order to conquer the disadvantage of the traditional Immune Neural Network (INN), the paper presents INN model which is based on extenics. With matter-element analysis, the model can solve the problem that antibody identifies and memorizes antigen in immune system. The model also can make correct judgments about activation or control of nerve cell. Consequently, the structure design of INN can be optimized. And then, the new model is applied in experiment which is used for solving the problem of nonlinearity function. Based on experiment results, the model is compared with the traditional neural network. Simulation results indicate that the new model has better convergence and stability.

PSuD-13

New Hybrid Genetic Algorithm for Scheduling Independent Meta-tasks in Computational Grid

De-cai Huang, Yan-ping Zhong, Duan-yang Liu, Yi-hong Lu
Zhejiang University of Technology, China

Task scheduling algorithms are key techniques in task management system of computing grid. Traditional heuristic task scheduling algorithms do not work well in an open, heterogeneous and dynamic grid environment of real world, because almost all of the task scheduling problems in computing grid are NP-hard. In this paper, a new hybrid genetic algorithm is presented to solve the problem of scheduling independent meta-tasks in computing grid. This algorithm keeps the variety of population by adjusting the structure of the algorithm, and it also improves the local search ability by adding the adjusting operation for the given scheduling model. Theory analysis and experimental results illustrate that the algorithm has good global and local search ability, which can avoid premature convergence. The simulation comparing with other scheduling algorithms shows that it gets more minimum makespan and has good convergent speed.

PSuD-14

Application of Neural Network to Surface Defect Recognition of Steel Plate and Strip

Guifang Wu1, Haichao Zhang1,2, Xiuming Sun1, Jinwu Xu3, Ke Xu3
1.Henan University of Science & Technology, China
2.Huazhong University of Science & Technology, China
3.University of Science & Technology Beijing, China

There are two main important stages in surface inspection of steel plate and strip, including surface defect detection and recognition, and the latter is mainly discussed. All defect data were acquired from a certain product line and can be divided into 12 classes, and their causes were analyzed and presented respectively. Then characters were extracted and divided into 5 classes: Gray level, geometrical, textural, projection and fractal features. Genetic algorithm was presented to select features, and an optimized character set was achieved and set as input parameters of neural networks, the recognition effects of BP and LVQ neural network were studied, and the advantages and disadvantages were discussed. Experiment results show that neural network can settle the automatic recognition problem of surface defects on steel plate and strip perfectly.

PSuD-15

Modeling of HIV/AIDS Transmission and Its Analysis

Ying Xu, Gen Qi Xu
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In this paper, we formulate a HIV/AIDS model with vertical transmission, infection-age, AIDS-age and the role of individuals with AIDS in HIV transmission. We assume that there is an imperfect vaccine with therapeutic effect, which induces reversal from the AIDS stage to asymptomatic stage. From this HIV/AIDS model we can get that the total population decreases when the death rate caused by AIDS is not equal to zero. In order to analyze dynamic behavior of population, we also investigate the linear system. By the C_0 semigroup theory of linear operators on Banach space, we prove well-posedness of the model and existence of the positive solution.

PSuD-16

Noninvasive Temperature Measurement System Based on Backscattered Ultrasound

Xinying Ren, Shuicai Wu, Yi Zeng
Beijing University of Technology, China

The noninvasive estimation of tissue temperature and state is a key problem in hyperthermia. The goal of the project is to develop a method and system, which enables the noninvasive monitoring of changes in temperature distribution. It may be realized by ultrasound. After detection of shifts in echo location of backscattered ultrasound using cross-correlation analysis technique, the relation of these shifts and temperature rise is derived form first principles and in-vitro experimentally validated. A signal sampling and processing system has been established, which mainly consists of ultrasound emitter and receiver, high speed AD gathering clip and PC. Preliminary results show the feasibility of this ultrasonic noninvasive thermometry.

PSuD-17

Digital Signatures with Tight Security Reduction from Linear Feedback Shift Register

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1.Shanghai JiaoTong University, China

2.National Laboratory for Modern Communications, China
For practical usages, it is often desirable to speed up the cryptographic systems without any security lost. A security reduction is tight when breaking the cryptographic primitive leads to solving the well established problem with sufficient probability（ideally 1）. In this paper, we propose a secure signature scheme based on n-th linear feedback shift register sequences over $GF(q)$. Our scheme enjoys the following attractive features: (i) its security property is proved in the random oracle model to be tightly related to the State-based computational Diffie-Hellman(S-CDH) problems; (ii) main computation operations are performed in $GF(q)$. Since S-CDH problem is equivalent to CDH problem in $GF(q^n)$, the proposed scheme successfully enhances the security of the system with low computational costs.

PSuD-18

Electric Power Load Profile Estimation Based on Kernel Independent Component Analysis

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Under the deregulated environment of electric power market, the different entities have to estimate the load profile of the users in order to let them pay the bill without the detail knowledge of power grid .In this paper, the kernel independent component analysis algorithm, i.e. whitened kernel primary component and independent component analysis algorithm, has been presented, which can be used for estimating the load profile by the means of part of branches of power grid. Further simulation on IEEE 9 bus system shows that it has better flexibility and robustness compared with independent component analysis.

PSuD-19

Algorithm of Common Quadratic Lyapunov Functions for Switched Discrete-time Systems

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2.Yan'an Univertiy, China
An algorithm to search common quadratic Lyapunov functions for switched discrete-time linear systems is proposed. To do this, an equivalent relationship is shown between switched continuous-time systems and switched discrete- time systems with a kind of bilinear transformations, an illustrative example is presented with typical steps to show how to find common quadratic Lyapunov functions. Finally, a new condition is obtained for switched planar discrete-time systems, which is simpler than the existing results.

PSuD-20

Comparison of Control Approaches for Robot Manipulator

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This paper presents the effectiveness of the proposed controller by comparing the results with a renowned control method for position control of robot manipulator. In order to achieve the high precision in robot arm position at high speed a Quasi-Linear Minimal Order Feedback Controller has been proposed. Under this design, the pole of the lead-lag compensator depends on the gain of open loop system. It shows that fast tracking system can be realized with a reduced control effort. The controller requires only the output measurement as compared to some other well known control approaches. In this paper the fast tracking performance of proposed controller for linearised robotic arm model is compared with Linear Quadratic Regulator (LQR). The designed controller not only guarantees asymptotic tracking of the desired trajectories, but also ensures the safety. The simulation results show that the new strategy yields better results.

PSuD-21

Recurrent Neural Networks for Nonlinear Filters of Vehicle Navigation Systems

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For vehicle integrated navigation systems, real-time estimating states of the dead reckoning (DR) unit is much more difficult than that of the other measuring sensors under the indefinite noises and nonlinear characteristics. Compared with the well known extended Kalman filter (EKF), a recurrent neural network is proposed for the solution, which not only improves the location precision, the adaptive ability of resisting disturbances, but also avoids calculating the analytic derivation and Jacobian matrices of the nonlinear system model. In order to test the performances of the recurrent neural network, these two methods are used to estimate states of the vehicle DR navigation system. Simulation results show the recurrent neural network is superior to the EKF and is a more ideal filtering method for vehicle DR navigation.

PSuD-22

The Noninvasive Reconstruction of 3D Temperature Field in Biological Body with Monte Carlo Method

Kai-Yang Li, Cheng Chen and Shao-Ping Zhang
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As a new noninvasive functional imaging technology, the three-dimensional thermal diagnosis has become a potential assistant diagnosis method in medical field because of its unique mechanism of diagnosis. But the reconstruction of 3-D heat source is very complicated and difficult. In the paper just from the surface temperature data, the three-dimensional heat distribution and temperature distribution for organisms can be reconstructed by solving Pennes bio-heat equation with the Monte Carlo method. Concretely, the inverse problem of heat conduction can be solved by means of the Markov chain Monte Carlo method based on Hierarchical Bayesian Models, and the three-dimensional heat distribution and temperature field can be reconstructed through the Monte Carlo method of fixed random walk.

PSuD-23

A New Research Method of Direct Torque Control Based on Predictive Control of Variable Structure Control

Xiying Ding, Xiaoran He, Shuqiu Gong, Xiaona Ma, Qiang Liu
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The article adopts two different method to solve the ripple problem of direct torque control in the low speed region according as different control frequency. They are variable structure control. In the subaltern low frequency region, the partition of flux linkage region is added and the system optimizes the choice of switch vector. In exceeding low frequency region, the system utilizes the predictive control to reduce the ripple of torque. Synchronously the genetic algorithm (GA) is used to optimize system parameters. GA solves the problem that predictive control makes the system increase dependence to parameters. The result of simulation testifies the method can effective reduce torque ripple amplitude. GA can accomplish parameter optimization at three generations. At this time, relative error has only 2%.

PSuD-24

A Collaborative Platform for Human Modeling

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2.Yu Lin Normal University, China

We propose a human modeling framework based on the commonly available communication platform and illustrate it with the implemented software that can be used as a core part for different real life applications.It is possible to perform their collaborative interactive modifications with concurrent synchronous visualization at each client computer with any required level of detail. The platform provides a muscle modeling and assembling environment and changes paradigms between 3DMAX, Smarteam (PDM software) and Human Creator System (HMCS). The platform is illustrated for human muscle modeling and assembling analysis as an example, and provides a collaborative intelligent environment for the model of products, aiming at integrating people, process and data in the model development.

PSuD-25

Moving Target Detection and Labeling in Video Sequence Based on Spatial-Temporal Information Fusion

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A novel method of moving target detection based on spatial-temporal information fusion was proposed. It combines the temporal properties within multiple frames and the spatial information in single frame of a moving target in video image sequence by using time-domain recursive filtering for background recovering and spatial image segmentation for separation of target from background. Together with follow-up morphological filtering and blob analysis, the area of an interested moving target can be detected and labeled by bounding box. Its application to swimmer tracking in underwater swimming video image sequence manifested the effectiveness of the method, which is expected to be applied to the implementation of underwater automatic tracking swimming video system.

PSuD-26

Application of Neural Network Fuzzy Logic Self-Organizing Recognition in Tool Wear Monitoring

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The wear of cutting tools is a thorny problem because there is not a proper way to monitor it. In fact, there are tow TCM(Tool Condition Monitoring) types ,which are indirect monitoring and image monitoring. Because the process signal analysis is usually gather result of a lot of cuts edge work, the indirect way is not so sensitive as the image way. The biggest difficult problem of image measures lies in the cutter worn degree that is difficult to judge. Most method use fuzzy recognition rule to discern through expert experience. In order to solve this problem, this paper proposes a new image monitoring way that combined BP neural network with fuzzy recognition. Firstly, on the basis of analysis image characteristic of the worn cutter, it utilizes run length code technology to refine out the edge of tool worn region. Secondly, the tool station is confirmed according to the largest width Y_{max} and average width Y_{av} of worn tool. Thirdly, we have designed structure of Neural Network Fuzzy Logic Self-organizing recognizer to discern input parameter and give output parameter. During the course of discerning, neural network fuzzy recognizer of worn cutter is utilized off-line training network. It can be exported best through calculating online. The reaction speed of this kind mode is fast. BP neural network has study function and association ability. It can use the function of contacting memory to give recognition decision for some samples that is not in training samples.

PSuD-27

A Genetic Algorithm for controlling P2P Traffic

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It is necessary to control the P2P traffic while the P2P application occupy the bandwidth of the bone of Internet in a great measure. Instead of only reducing the P2P traffic, the paper suggests an intelligently manage P2P traffic method for ISPs based on P2P communities. The Proxy of Content Caching (PCC) node is presented, which is used to manage the P2P content locally caching and to serve from an on-network source. To deal with the QoS-sensitive application, the problems of building the Core Overlay Multicast Tree (COMT) among the PCC nodes can be reduced to the Minimal Steiner Tree Problem (MSTP). And the off-line genetic algorithm (GA) with destination-oriented representation is proposed to represent chromosomes and

genetic operators. Simulation experimental results show that our model can obtain a near optimal solution for building the core multicasting tree which has the feathers of lower transit bandwidth, cost and high scalability. The GA can reduce the traffic among ISPs.

PSuD-28

A kernel Fisher Classifier for Media Asset Management

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Media asset management includes processes needed to support the storage, search, and retrieval of multimedia data, including audio, video, images, 2-D and 3-D models, as well as textual information. Audio indexing plays a key role in this process. The main objective of the indexing process is to assign labels to the audio-visual data in order to describe its content. In this paper, a classifier with the kernel Fisher discriminant criterion was proposed. Instead of simply concatenating different sources features, we modeled each different feature set separately and made decision by the output scores of the KFD-based classifier. A significant components selection procedure were presented to reduce the high dimensionality of the long feature vectors before fed to the classifier. The speaker verification and key-word spotting experiments indicate the superior recognition accuracy can be obtained in speaker and speech recognition，and has great promise for media asset management.

PSuD-29

Generation of Intelligent Group Behavior of Autonomous Mobile Robots Using Sensors

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Complex "lifelike" behaviors are composed of local interactions of individuals under fundamental rules of artificial life. In this paper, fundamental rules for cooperative group behaviors, "Avoidance" of multiple autonomous mobile robots are represented by a small number of fuzzy rules. Fuzzy rules in Sugeno type and their related parameters are automatically generated from clustering input-output data obtained from the algorithms for the group behaviors. Simulations demonstrate the fuzzy rules successfully realize group intelligence of mobile robots.

PSuD-30

Research on DC Operating Characteristic Improvement of High-frequency Choke

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High DC current chokes are required to keep constant inductances at rated operating currents in low voltage and high current output electronic devices. While the inductance of choke with air-gapped core decreases quickly when the DC current increase. A piece of permanent magnet was inserted the air-gap in magnetic core to provide reverse DC bias to the magnetic field produced by the DC current in the coil. The permanent magnet changed the original working point of the inductor and the inductance could be constant in a large DC currents scope. The results measured verified that the improvement is effective. These kind of inductors had been successfully used in some space devices.

PSuD-31

PLM System Performance Tuning

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Before the PLM (Product Lifecycle Management) system's implementation, the solution suppliers structure the system carefully according to the current data and the future 3~5 years forecast. But the enterprise is in a dynamic environment, and affected by the market. Therefore, the amount of product data is increased by the development of the enterprise dynamically. With the increasing data, the user may face the following issues: can not create product data or the system is too slow. Ideally the PLM system needs to be tuning after on product 0.5~1 year. In this article, the steps for performance turning are introduced firstly, then the key factors which affect the PLM system are discussed, such as: virus, bugs of PLM system, 3rd party's application, server performance (especially database) and network. All the factors are analysed in details，for example, factors which affect the server are database parameters, table-space allocation, disk I/O layout, memory allocation, CPU utilization and software installation. The database parameters can greatly affect the system performance (Oracle SGA, number of concurrent users). If the table-space is full, the user cannot create data in PLM, and the system will be very slow. A performance tuning example is also provided in the article.

PSuD-32

Solving Flexible Planning Problems in the Distributed Settings

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Several advances have occurred in synthesis of plans in a centralized fashion under classical assumption in recent years. Traditionally, planning problems are cast in terms of imperative constrains that are either wholly satisfied or wholly violated and work only in central environment. We present distributed flexible planning to get efficiency of parallel processing the robustness of distributed systems, the simplicity of incremental construction and preference-based information of flexible planning. Specifically, we propose two distributed Flexible Graphplan system: DFGP and IG-DFGP. Decomposition of goal and action set in DFGP is carried out manually and that in

IG-DFGP is carried out automatically. Experimental results show that both these distributed planners are orders of magnitude faster than Flexible Graphplan.

PSuD-33

Effects of Temporal Fine Structure on Mandarin Chinese Recognition----Some Implications for Cochlear-Implants

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Although temporal envelop cues have been proved sufficient to speech recognition in quiet, recent studies have shown that temporal fine structure was important to speech intelligibility under noise conditions. In this study we evaluated the relative contributions of temporal fine structure cues in different frequency bands to Mandarin speech recognition both in quiet and in noise. Chinese tone, vowel, consonant and sentence recognition scores were measured in a 4-channel continuous interleaved sampling (CIS) simulation model with six kinds of carriers: all noise carriers (N1234), all fine structure carriers (F1234), and fine structure carrier in one channel while noise carriers in the others (F1N234, F2N134, F3N124, F4N123). Results showed that low-frequency fine structure below 400 Hz contributed significantly to tone recognition, while mid-frequency fine structure from 400 to 1000 Hz contributed most to vowel and consonant recognition in quiet. But in severe noise it was the common contributions of the temporal fine structure at all frequency ranges that improved the recognition performance of vowel and consonant significantly. For sentence recognition the mid-frequency cues made an importance effect and tones contributed most to sentences compared to vowel and consonant. These results suggest that speech intelligibility in noise could be improved by incorporating proper fine structure cues in CIS model.

PSuD-34

Framework and Education of Biosystem Informatics

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Concept of biosystem informatics is brought forward. Frame of the foundation theory and study levels of biosystem informatics is given, and possible study tasks and contents are discussed. In the end, author appeals to government to develop the biosystem informatics education.

PSuD-35

A Three-dimensional Electromechanical Model of Canine Heart

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The aim of this study is to validate an excitation-contraction coupled three-dimensional computational model of canine ventricles with true anatomical geometry and fiber orientations from diffusion tensor MRI and to study the motion and deformation of the ventricles. Passive and active mechanical properties of cardiac tissue have been considered in this investigation. The electrical activation conduction sequences were simulated based on solutions of reaction-diffusion equations with a strategy of parallel computation. The results show that there is a significant heterogeneity of strain from end of isovolumic contraction to end of systole, while fiber strains are almost similar for all left ventricular regions during the begin-ejection phase, which may contribute a physiologically uniform contraction pattern. In addition, the first main stress distribution within cross section of biventricles during ejection is calculated and results show a rapidly elevated systolic stress during the early ejection period. In all, cardiac wall mechanics appear sensitive to the fiber orientations. This study suggests that such an electromechanical heart model has the potential to be used to assess the mechanical function of ventricles, and also provide probabilities in future's patient-specific computer modeling for various forms of cardiac pathology.

PSuD-36

Interdisciplinarity in Focus: Possibilities in A Prey-Predator Dynamics

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This paper aims at understanding the dynamics of two populations, prey and predators, as they struggle to survive. Will there be a considerable difference if these members organize in groups in order to fulfill common goals? Overcoming disciplinary boundaries has been established as a chance to borrow, mutually from different disciplines, experiences that allow us to pursue the answers related to how nets of heterogeneous elements are formed and dissolved, and how those associations compete to produce certain results. Extensions to Social Psychology are countless, which allow us to think about phenomena such as altruism and wars. The research methodology chosen consists of simulations made with computer-generated virtual animations of movements of aphids and lady beetles, in two scenarios: 1. In which members move at random; 2. In which members associate to search for a common goal. According to what the simulations indicate, it is possible to observe an emergence of cooperation at the second scenario, along with moments of relative sharing of abundant food among individuals as well as relative survival and reproduction guarantee.

PSuD-37

Multineuronal Action Potential Sorting Based on Evidence-theoretic Neural Network with Automatic Superposition Resolution

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Separation of action potentials in multiunit extracellar recording is an important step in neuroscience research.

The frequent occurrences of action potential superposition make the accurate separation difficult, especially under complex background noises. In this paper, an evidence-theoretic neural network is applied to deal with the problem. The overlapping spikes are first distinguished from other spikes using the neural network classifier based on the evidential theory. Then the overlapping spikes are decomposed step by step by template extracting in the classification process. The tests on synthetic data show good performance of the proposed method.

PSuD-38

Dynamic Clustering Algorithm Based on Immune Network

Jiang Zhong, Yong Feng, Luosheng Wen, Chunxiao Ye
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Clustering is an important problem that must often be solved as a part of more complicated tasks. It's difficult to indicate the rational number of partitions in the data set. This paper proposes a novel dynamic clustering algorithm based on the artificial immune network and tabu search (DCBIT). The algorithm includes two phases, it begins by running immune network algorithm to find a clustering feasible solution (CFS), then it employs tabu search to get the optimum cluster number and cluster centers on the CFS. We develop a new algorithm for finding rational number of clusters based on a tabu search technique. Preliminary computational experience on the developed algorithm are encouraging and compare favorably with results from other methods.

PSuD-39

Chlorophyll Estimation Based on Vis/NIR Spectroscopy of Tea Plant at Leaf-scale

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A rapid, non-contact and nondestructive way to estimate the chlorophyll index of tea plant was put forward based on Vis/NIR spectroscopy. The relationship was developed between nondestructive Vis/NIRS measurement and the chlorophyll index from Minolta SPAD-502. A field spectroradiometer (Fieldspec HandHeld, Analytical Spectral Devices, Inc.) was used with the wavelengths from 325 to 1075 nm. The Vis/NIR spectra were acquired from 186 samples of tea plant at leaf level. The chemometrics tools contained partial least squares (PLS) and multiple linear regression (MLR) were applied to build the regression models and seek the fingerprint spectra. The excellent model with high prediction correlation (0.908) was obtained by PLS based on entire wavelengths. The loading weight of latent variables from PLS model was used to look for the fingerprint wavelengths. To evaluate the virtue of these wavelengths, the MLR models were built with these wavelengths. The significance of these wavelengths variables was analyzed by ANOVA. The MLR model was found to be statistically significant at 99% confidence level. Three wavelengths variables (488, 695 and 931 nm) were selected with statistical significance at 99% confidence level. The good result was obtained from MLR model with the three fingerprint spectra. The potential of Vis/NIR to predict the chlorophyll index was ascertained. And the fingerprint spectra, which were strongly related with the chlorophyll index, were obtained through chemometrics tools. These individual fingerprint wavelengths could be used to exploit the simple, low-cost and efficacious instrument.

PSuD-40

Pattern Recognition of Oranges and Prediction of Sugar Content Based on Wavelet Transform Combined BP-ANN

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Vis/Near infrared reflectance spectroscopy appears to be a rapid and convenient non-destructive technique that can measure the quality and compositional attributes of many substances. In this study, a nondestructive method for the classification of orange samples according to their growing conditions, geographic areas was developed using Vis/Near infrared spectroscopy (FieldSpec Pro FR (325–1075 nm)/ A110070). With the use of Savitzky-Golay smoothing and multiplicative signal correlation (MSC), the differences of the NIR spectra among different orange samples were enhanced. The results showed that the NIR spectra of the samples were moderately clustered in the principle component space and pattern recognition wavelet transform combined BP-ANN provided satisfactory classification results. Additionally, a partial least square (PLS) method was constructed to predict the sugar content of certain oranges. Before it, the spectral data were examined for unusual outlying samples by PCA. It showed excellent predictions of the sugar content of oranges, with SEP values of 0.290 and 0.301 for Shatangju and Huangyanbendizao, respectively.

PSuD-41

Fast Measurement of Acidity in Grape Juice Beverage Using Vis/NIRS and Chemometrics

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The fast and non-destructive detection of acidity in grape juice beverage is important. Visible and near infrared spectroscopy (Vis/NIRS) technique was applied to achieve this purpose. Three different chemometrics methods were executed to determine the acidity of grape juice beverage. 305 samples were selected for the calibration set and 75 samples for the validation set. The smoothing way of Savitzky-Golay and standard normal variate (SNV) were applied for the preprocessing of original spectral data. The first five principal components (PCs) extracted by principle component analysis (PCA) analysis were employed as the inputs of BP neural network (BP-NN). Least-squares support vector machine (LS-SVM) and partial least squares (PLS) models were established based on the whole spectra data. An excellent precision and accuracy was achieved by PLS, BP-NN and LS-SVM models since the determination coefficient for prediction (R_p^2), RMSEP and bias were 0.956, 0.053878 and 0.003333 for PLS, 0.938, 0.083819, and -0.05353 for BP-NN, and 0.997,

0.014044 and -0.00262 for LS-SVM, respectively. It is concluded that Vis/NIRS technique can quantify the SSC of grape juice beverage fast and non-destructively. The process is simple and easy to operate than chemistry methods. In this study, the generation ability of LS-SVM, PLS and BP-NN models were also investigated. It could be concluded that LS-SVM is a promising alternative for the regression analysis to quantify acidity of grape juice beverage.

PSuD-42

Improved Adaptive and Neuron Learning Detecting Approaches of Harmonic and Reactive Current for APF

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The adaptive and neuron leaning detecting approaches of harmonic and reactive current play an important role in the active power filter (APF). In this paper, the adaptive and neuron learning detecting approaches are analyzed, and it is pointed out that there are errors in these learning solutions in steady state. To eliminate the steady errors of the learning solutions, several novel adaptive and neuron learning detecting architectures of the harmonic and reactive current for APF are proposed in this paper. The simulations have shown that the new adaptive and neuron detecting approaches of harmonic current are more efficient than the conventional one for APF.

PSuD-43

A New Honeybee Swarm Algorithm for Multiobjective Optimization

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Honeybee mating optimization recently proposed is a population-based hybrid algorithm, which is inspired by the process of real honeybees mating. It has some advantages include a simple structure, immediately accessible for practical applications, ease of implementation, speed to acquire solutions, and robustness and has been concerned closely. However, the study and application is still limited. In this paper, by redefining mating operator and breeding operator we present a new honeybee swarm optimization algorithm for multi-objective optimization. The results tested on some well-known problems show its performance in conducting an extensive search in the entire search space and the high potential of the proposed algorithm to solve multi-objective optimization problems.

PSuD-44

ART1 Neural Network Based Approach to Mechanism Retrieval in Conceptual Design of Mechanical System

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Selecting appropriate mechanism types that meet design requirements is a critical problem often encountered in conceptual design of mechanical system. A novel approach to mechanism coding is presented at first, in which the features of motion function and function quality for mechanism can be expressed respectively with a list of binary vectors. A retrieval approach to mechanism type selection is then proposed using ART1 neural network. Under this approach, sets of binary vectors representing all mechanisms are fed into an ART1 network to structure mechanism clusters and a proper number of reference mechanisms can be received after a binary vector representing design requirements is fed into the pre-grouped network. Compared with other retrieval system, by adjusting the value of vigilance parameter, the designer can obtain an optimal mechanism or several satisfactory mechanisms in terms of his design intent. Finally an engineering example is given to indicate the rationality and feasibility of the proposed approach.

PSuD-45

A New One Class Mahalanobis Hyperplane Learning Machine Based on QP and SVD

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In this paper, we propose a new kernel Mahalanobis Hyperplane Learning Machine (MHLM) for one class classification (OCC). We propose to incorporate with the sample covariance matrix information and thus utilize the Mahalanobis distance rather than Euclidean distance in standard One Class Support Vector Machines (OCSVM). We use the centered kernel matrix and the Singular Value Decomposition (SVD) method to estimate the true inverse of the sample covariance matrix. We formulate the MHLM a Quadratic Programming (QP) problem and solve it using standard QP solvers. To avoid the existence of zero eigenvalues of the sample covariance matrix in high-dimensional feature space, we introduce a regularization method by using an uncertainty model to address a robust optimization problem. We investigate the initial performances of MHLM using the UCI benchmark datasets.

PSuD-46

Multidisciplinary Design Optimization Applying Exploratory Algorithm

Huihui Liu, Wenhui Fan, Yuming Yuan, Dongbo Zhao
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Multidisciplinary design optimization (MDO) has become more important on complex product design in recent years. MDO aims to solve coupling problem during subsystems by different optimization algorithms such as gradient algorithm, genetic algorithm. In this paper, a new MDO method based on adaptive simulated annealing (ASA) and multi-island genetic algorithm (MIGA) is proposed and it is applied to a medicinal numerical example. The simulation results indicated the advantages on accuracy and convergence compared to MDO methods based on numerical algorithm.

PSuD-47

Multi-resolution Code Recognition of Plane Curve Using Haar Orthogonal Matrix

Xiuqiao Xiang, Jianzhong Zhou, Junjie Yang, Xueli An, Bing Peng
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Multi-resolution code recognition of plane curve using Haar orthogonal matrix is artfully proposed in this paper. Firstly, plane curve is orientated by its main direction. Secondly, the horizontal and vertical coordinates of plane curve are fast transformed by Haar orthogonal matrix respectively, then corresponding outcome is divided, and multi-resolution slopes at different position of plane curve are obtained simultaneously. Thirdly, these slopes are encoded, obtained codes not only represent characteristic of plane curve, but also are invariant to rotation, scale and translation, moreover, they have multi-resolution feature. Finally, through these codes the multi-resolution recognition of plane curve is proceeded from coarse to fine. Both theoretical analysis and experimental results demonstrate the effectiveness of the proposed approach.

PSuD-48

Bayes Cognitive Ellipsoidal Learning Machine for Recognizing Process Imitation

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3.Air Force Equipment Academy, China

The enclosing machine learning concept proposed by Wei etc al tries to give a simple but efficient way for function imitation of the cognizing and recognizing process of human brain. Enclosing machine learning focuses on cognitive description of each single class and thus obtain a cognitive knowledge of each single class (imitation of cognizing process), which is represented by the class description boundary. Consequently, cognitive classification (imitation of recognizing process) algorithms are used for assignment of given unknown patterns. In this paper, we presented a novel cognitive recognizing algorithm for recognizing process imitation based on enclosing machine learning via ellipsoidal class description and Bayes decision theory. Firstly, each class samples were described by a compact and flexible ellipsoid. Then, we obtained the optimum classification algorithm for unknown pattern's assignment using Bayes decision theory. Finally, applications to real world UCI benchmark datasets show comparable even superior performances compared with SVMs.

PSuD-49

An Intelligent Exploration Method to Improve Performance of XCS in POMDP Environments

Ali Hamzeh, Adel Rahmani
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Explore/Exploit dilemma is one of the most challenging issues in reinforcement learning area as well as learning classifier systems such as XCS. In this paper, an intelligent method is proposed to control the exploration rate in XCS to improve its long-term performance. This method is called Intelligent Exploration Method (IEM) and is applied to some benchmark problems to show the advantages of adaptive exploration rate for XCS.

PSuD-50

RBF-based and Multiple Receive-Antennas Aided Multiuser Detection for STBC Systems

Hongwu Liu, Ji Li
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A multiuser detection (MUD) scheme using a radial basis function (RBF) network for a space-time block coding (STBC) systems with multiple receive-antennas is proposed. The neuron centers of the RBFs are jointly carried out in space and time domains, which lead to a powerful technique to combat the interference resulting from different sources. Simulations compare the proposed scheme with traditional receiver structures such as the minimum mean square error (MMSE) receiver and maximum likelihood detection (MLD). It shows that this RBF-based space-time MUD can be flexibly trade off between the bit error rate (BER) performance, the center initialization-rate and the number of the receive-antennas.

PSuD-51

Feature Extraction for Cancer Classification Using Kernel-Based Methods

Shu-tao Li and Chen Liao
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In this paper, kernel-based feature extraction method from gene expression data is proposed for cancer classification. The performances of four kernel algorithms, namely, kernel Fisher discriminant analysis (KFDA), kernel principal component analysis (KPCA), kernel partial least squares (KPLS), and kernel independent component analysis (KICA), are compared on three benchmarked datasets: breast cancer, leukemia and colon cancer. Experimental results show that the proposed kernel-based feature extraction methods work well for three benchmark gene dataset. Overall, the KPLS and KFDA show the best performance, and KPCA and KICA follow them.

PSuD-52

Fast parametric time-frequency modeling of nonstationary signals

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This paper studies the modeling of nonstationary signals in time-frequency plane using a type of five-parameter sheared Gabor atoms. These five parameters, i.e. the dilation, chirprate, dipersionrate, modulation and transla-tion, have clear physical meanings and their optimization is an extremely diffi-cult task over the continual parameter space. In this paper, a fast procedure is proposed without explicitly exploring the optimal values of these parameters on the continual space. Here, these five parameters are assigned with random val-ues across their full ranges, creating a large library of candidate Gabor atoms. Then a fast algorithm is used to select a minimal number of atoms that best ap-proximate the nonstationary signal, leading to significantly improved modeling efficiency.

The proposed method is applied to several benchmark problems in-cluding the bat signals, EEG signals and speech signals. The simulation results confirm its efficacy.

September 17, 2007 Monday

MoB7 8:30-10:10
Room1
Invited session: High Performance Computing and Data Mining on Biomedicine

MoB7-1 8:30-8:50

Predicting functional protein-protein interactions based on computational methods

Luwen Zhang, Wu Zhang
Shanghai University, China

Protein-protein interactions play a crucial role in the cellular process. In recent years, yet new experimental techniques have been developed to discover the protein-protein interaction networks, the accuracy and coverage has still proven to be limited. Computational approaches come into being essential both to assist in the design and validation of experimental studies and for the prediction of interacted proteins. This paper presents a survey of the major computational methods for detecting protein-protein interactions, and expatiates on their key contribution by introducing the experimental methods, the typical computational methods and the improvement over them in turn.

MoB7-2 8:50-9:10

Two Phase Indexes Based Passage Retrieval in Biomedical Texts

Ran Chen, Hongfei Lin, Zhihao Yang
Dalian University of Technology, China

The biomedical literature is growing at a double-exponential pace. Passage-level retrieval is more effective to provide the information section than document-level retrieval. This paper presents a method of two phase indexes based passage retrieval. First two phase indexes: paragraph index and sentence-level half-overlapped windows index are built. Then, BM25 model is used to retrieval on the two phase indexes. At last, the passage and paragraph retrieval results are combined as the result of the passage retrieval. The experiment result shows that the performance is improved 5% with two phase indexes than only with the paragraph index.

MoB7-3 9:10-9:30

Multimodality medical image fusion based on multiscale geometric analysis of contourlet transform

L. Yang, B. L. Guo, W. Ni
Xidian University, China

As a novel multiscale geometric analysis tool, contourlet provides many advantages in comparison with conventional multiresolution analysis. In this paper, a new fusion algorithm for multimodal medical images based on contourlet transform is proposed. A novel contourlet contrast measurement is first developed, which is proved to be more suitable for human vision system (HVS) and image processing tasks. All fusion operations are performed in contourlet domain. Different fusion rules including local energy, weighted average and region based contourlet contrast are proposed for coefficient selection in the lowpass and highpass subbands, which can preserve more details in source images and further improve the subjective quality of fused image. Extensive fusion experiments have been made on three groups of multimodality CT/MR datasets, five objective criterions are employed. Both visual and Quantitative analysis show that comparing with conventional image fusion algorithms, the proposed approach can provide a more satisfactory fusion outcome.

MoB7-4 9:30-9:50

Design and Path Planning for a remote-Brained Service Robot

Shigang Cui1, Xuelian Xu2, Zhengguang Lian2, Li Zhao2, Zhigang Bing2
1.Institute of Semiconductors, CAS, China
2.Tianjin University of Technology and Education, China

This article introduced an effective design method of robot called remote-brain, which is made the brain and body separated. It leaves the brain in the mother environment, by which we mean the environment in which the brain's software is developed, and talks with its body by wireless links. It also presents a real robot TUT06-B based on this method which has human-machine interaction, vision systems, manipulator etc. Then it discussed the path planning method for the robot based on ant colony algorithm in details, especially the Ant-cycle model. And it also analyzed the parameter of the algorithm which can affect the convergence. Finally, it gives the program flow chat of this algorithm.

MoB7-5 9:50-10:10

A Robust Approach to Find Effective Items in Distributed Data Streams

Xiaoxia Rong1, Jindong Wang2
1.Shandong University, China
2.Shandong Computer Science Center, China

A data stream is a massive unbounded sequence of data elements continuously generated at a rapid rate. Consequently, the knowledge embedded in a data stream is more likely to be changed as time goes by. Data items that appear frequently in data streams are called frequent data items, which often play a more important role than others in data streams management system. So how to identifying frequent items is one of key technologies. As distributed data streams management system is concerned, there are many input data streams having different effect on result, the pure character of frequency is unfit for finding the important data. To solve this problem, effective data of distributed data streams is defined in this paper, which combines the frequency of items and the weight of streams. Based on an optimization technique that is devised to minimize main memory usage, a robust mining approach is proposed. According to this algorithm, the effective data can be output with limited space cost. At the same time, the sensitivity of algorithm is analyzed which shows the output result is within the error given by the user. Finally a series of experiments show the

efficiency of the mining algorithm.

MoA9 10:30-12:10
Room1
Topic: Computational methods and intelligence in biomechanical systems, tissue engineering and clinical bioengineering

MoA9-1 10:30-10:50

Computation of Uniaxial Modulus of the Normal and Degenerated Articular Cartilage using Inhomogeneous Triphasic Model

Haijun Niu1, Qing Wang2, Yongping Zheng2, Fang Pu1, Yubo Fan1, Deyu Li1
1.The Beihang University, Beijing, China
2.The Hong Kong Polytechnic University, China

Articular cartilage is a biological weight-bearing tissue covering the bony ends of articulating joints. Subtle changes in tissue composition can lead to degeneration of articular cartilage. This study develops an improved inhomogeneous triphasic model with four parameters and extracts the uniaxial modulus (Ha) for both normal and degenerated articular cartilage, and then predicts the swelling pattern of the cartilage. The results indicated that the new inhomogeneous triphasic model can extract uniaxial modulus more accurately, and the predict results also appeared to well match the experimental strain data. This inhomogeneous triphasic model can describe the depth-dependent material attribute of normal and degenerated articular cartilage more exactly.

MoA9-2 10:50-11:10

A cybernetic model to describe the dynamics of myeloma cell cultivations

Yuan-Hua Liu1, Jing-Xiu Bi2, An-Ping Zeng3, Jing-Qi Yuan1
1.Shanghai Jiao Tong University, China
2.Chinese Academy of Science, China
3.Hamburg University of Technology, Germany

A cybernetic framework is developed to modeling the dynamics of mammalian cell growth and metabolism. The partially substitutable, partially complementary nature of glucose and glutamine is considered in this model. The competition between transamination and deamination for utilization of glutamine to produce α-KG for TCA cycle is incorporated. In addition, competition of lysine utilization for protein formation and energy supplying is also involved due to lysine limitation found in our experiments. The model is found to be able to simulate the transients of the substrate and byproduct concentrations, the cell densities as well as the intracellular levels of the intermediates and enzymes. Myeloma cultivations are employed to validate the model.

MoA9-3 11:10-11:30

Effect of the Plantar Ligaments Injury on the Longitudinal Arch Height of the Human Foot

Yunfeng Yang1, Guangrong Yu1, Wenxin Niu2, Jiaqian Zhou1, Yanxi Chen1, Feng Yuan1, Zuquan Ding2
1.Orthopaedic department of Tongji hospital affiliated to Tongji University, China
2.Tongji University, China

Most of the foot deformities relate with the arch collapse or instability, especially the medial longitudinal one. Though the function of the plantar fascia to the arch height has been investigated by some authors, the other plantar ligaments` effects are still unclear. The purpose of this study is to explore the roles of the plantar soft tissues in the foot arch biomechanics, including the plantar fascia, spring ligament complex, short plantar ligament and long plantar ligament through normal adult fresh frozen specimens in different injured condition. Also, a three-dimensional finite element model of a normal left foot was developed, which was comprising most joints of the foot and consisted of bone segments, major ligaments and plantar soft tissue. The validity of the three-dimensional finite element model was verified by comparing results with experimentally measured data via the displacements and Von-mise stress of each bone segments. These intrinsic ligaments of the foot arch were sectioned in different sequences in the cadaveric experiment, which simulated the different pathologic situations of the plantar ligaments injury and described the bone segments displacement and stress distribution.

MoA9-4 11:30-11:50

Gene Prediction on Long DNA Sequence Using Multiple Sources of Evidence

Yang Weng, Xiao Li, Yunmin Zhu
Sichuan University, China

In the last few years, a variety of computational programs have emerged for predicting protein-coding genes and the performance of prediction have been improved, but the accuracy of predictions remains a low level, especially when implementing in large genomic sequences. It has proven that the accuracy of prediction can be improved by combining several computational predictions with other evidences. We present a new gene finding system, named as SCGPred, to improve the accuracy of prediction by combining multiple sources of evidence. These evidences include predictions from several computational gene finders and similarity alignments to EST and protein databases. By testing with two dataset composed of large DNA sequences of human, SCGPred gained a significant improvement in contrast to the best of ab initio gene predictors. In addition, SCGPred is superior to some other methods that used combinational approaches.

MoA9-5 11:50-12:10

Application of Image Processing and Finite Element Analysis in Bionic Scaffolds' Design Optimizing and Fabrication

Liulan Lin, Huicun Zhang, Yuan Yao, Aili Tong, Qingxi Hu, Minglun Fang
Shanghai University, China

Design optimizing is the key step in obtaining bionic scaffolds with proper shape and inner microstructure, which are two critical parameters for bionic scaffolds in Tissue Engineering. In this paper, the application of image processing and finite element analysis in the design

optimizing of bionic scaffold's shape and inner microstructure were studied respectively. The bionic scaffold's shape was obtained through Mimics' image processing and 3D reconstruction technologies. Finite element analysis (FEA) was used in evaluating the mechanical properties of scaffold's structure models with different macro-pores shape and distribution to obtain the optimized parameters. Three groups of bioceramic scaffolds samples were fabricated through an indirect method combining stereolithography (SLA) and slurry casting, and then mechanical experiments were tested. The change trendy of the compressive strength obtained through mechanical experiments was consistent with the FEA results basically so the significance of FEA in bionic scaffolds' design optimizing was proved.

MoA8 8:30-10:10
Room2
Invited session: The pattern recognition of EEG in Brain Computer Interfaces

MoA8-1 8:30-8:50
Pattern Recognition for Brain-Computer Interfaces by Combining Support Vector Machine with Adaptive Genetic Algorithm

Banghua Yang1,2, Shiwei Ma1,2, Zhihua Li1,2
1.Shanghai Key Laboratory of Power Station Automation Technology, China
2.Shanghai University, China

Aiming at the recognition problem of EEG signals in brain-computer interfaces (BCIs), we present a pattern recognition method. The method combines an adaptive genetic algorithm (GA) with the support vector machine (SVM). It integrates the following three key techniques: (1) the feature selection and model parameters of the SVM are optimized synchronously, which constitutes a hybrid optimization; (2) the aim of the hybrid optimization is to improve the classification performance of the SVM; and (3) the hybrid optimization is solved by using the adaptive GA. The method is used to classify three types of EEG signals produced during motor imaginations. It yields 72% classification accuracy, which is higher 8% than the one obtained with the individual optimization of the feature selection and SVM parameters.

MoA8-2 8:50-9:10
Measurement and Analysis of "yes" and "no" Responses by Auditory Stimuli using Multiple-choice Questions in the Human EEG

Ssanghee Seo, Haifeng Chen, Donghee Ye, Jungtae Lee
Pusan National University, Korea

This paper describes an approach to discriminate between "Yes" and "No" responses, which are the most elementary expressions of communication in human beings. For this purpose, the auditory stimulus was provided in the form of 5 multiple-choice questions. Each question had 4 options. The alpha activities of electroencephalography (EEG) in the "yes" and "no" responses were evaluated for each option. The value of the response time was predetermined. We analyzed the characteristics of the EEG components using discrete fourier transform (DFT) and the low frequency bands were analyzed using discrete wavelet transform (DWT) analyses. Additionally, we performed a power spectrum analysis of the evoked EEG signals during the "yes" and "no" responses of 5 healthy volunteers were recorded from 4 locations (F3, F1, F2 and F4). Percentage of the spectral power of the alpha band (8-13Hz) for the "yes" response was lower than that observed for the "no" response. Conversely, the amplitude of alpha band for the "yes" response was higher than that for the "no" response. These observations may provide a preliminary but nonetheless, an important understanding of how information may be processed during intellectual or cognitive activity.

MoA8-3 9:10-9:30
Design and Path Planning for a remote-Brained Service Robot

Shigang Cui, Xuelian Xu, Zhengguang Lian, Li Zhao, Zhigang Bing
Institute of Semiconductors, CAS, China
Tianjin University of Technology and Education, China

This article introduced an effective design method of robot called remote-brain, which is made the brain and body separated. It leaves the brain in the mother environment, by which we mean the environment in which the brain's software is developed, and talks with its body by wireless links. It also presents a real robot TUT06-B based on this method which has human-machine interaction, vision systems, manipulator etc. Then it discussed the path planning method for the robot based on ant colony algorithm in details, especially the Ant-cycle model. And it also analyzed the parameter of the algorithm which can affect the convergence. Finally, it gives the program flow chat of this algorithm.

MoA8-4 9:30-9:50
Pattern Recognition of Vis/NIR Spectra from Beer Using Least Squares Support Vector Machines Algorithm Model

Li Wang1, Dengsheng Zhu2, and Yong He1
1.Zhejiang University, China
2.Jinghua College of Profession & Technology, China

Visible/Near infrared (Vis/NIR) transmittance spectroscopy was applied in discrimination of beer varieties. By using partial least squares (PLS) analysis could get the latent variables (LVs) from original spectrum, the first seven LVs picked according to the accumulative reliabilities (AR) and residual variances (RV) would be taken as the inputs of least squares support vector machines model (LS-SVM). The LS-SVM is a new data mining algorithm. The total samples were randomly separated into calibration set and validation set. 180 samples from calibration set were used to build the model. Then this model was used to predict the varieties of 60 unknown samples from validation set and 96.67% recognition ratio was achieved with the threshold predictive error ±0.2. The determination coefficient (r) and root mean square error of prediction (RMSEP) were 0.9963 and 0.0982 respectively. It is indicated that Vis/NIR transmittance spectroscopy combined with PLS and

LS-SVM is an effective measure to discriminate varieties of beer.

MoA8-5 **9:50-10:10**

Pattern Recognition Based on Cognitive Mechanism

Tiancai Liang, Youguo Pi
University of Technology Guangzhou, China

A method of pattern recognition based on cognitive mechanism is proposed . In the method, pattern is defined to be made up of prototype and structure, process of recognition is performed with repository of prototype and knowledge. After analyzing mechanism of recognition , mathematics model and algorithm of recognition are presented deatily. In order to demonasty Finally, experiment for recognition of printed-digit is carried out, and result prove validity of the method proposed.

MoB4-b **10:30-12:10**
Room2
Ant colonies and particle swarm optimization and application-2

MoB4-b-1 **10:30-10:50**

An Improved Particle Swarm Optimization Algorithm Applied to Economic Dispatch

Yuzeng Li, Long Long, Shaohua Zhang
Shanghai University, China

This paper proposes a new practical optimization method applied to the economic dispatch (ED) in a power system. The proposed method is based on an improved particle swarm optimization algorithm and considers some restrict conditions of ED in a practical power system. By reinitializing them with some currently optimal values during every cycle of iteration, this proposed method can make some inactivity particles to be always within a very small area having an optimal solution. The proposed method can avoid effectively the “premature” of the classic particle swarm optimization (PSO) algorithm due to improve the cognized capacity of the classic PSO, thereby it is beneficial to obtain some optimal global solutions. The simulation results show that proposed method has some excellent characteristics of higher quality calculation precision and better computation efficiency, compared with some other PSO methods.

MoB4-b-2 **10:50-11:10**

Immune Particle Swarm Optimization Based on Sharing Mechanism

Chunxia Hu, Jianchao Zeng, Jing Jie
Taiyuan University of Science & Technology, China

Sharing mechanism is introduced into particle swarm optimization. Fitness values of particles are updated to sharing fitness values. Particles with higher sharing fitness value are punished and particles with smaller sharing fitness value are remained as memory particles. Particles are updated with memory particles and clone selection when global best have not changed in some continuous generations. Population diversity is increased by this way. At the same time the particle with the best fitness value is saved. The modified algorithm can avoid the local optimization and has better search performance to multi-peak functions. The experimental results show the modified algorithm has better convergence performance than standard particle swarm optimization algorithm.

MoB4-b-3 **11:10-11:30**

The Limited Mutation Particle Swarm Optimizer

Chunhe Song, Hai Zhao, Wei Cai, Haohua Zhang, Ming Zhao
Northeastern University, China

Similar with other swarm algorithms, the PSO algorithm also suffers from premature convergence. Mutation is a widely used strategy in the PSO algorithm to overcome the premature convergence. This paper discusses some induction patterns of mutation (IPM) and typical algorithms, and then presents a new PSO algorithm – the Limited Mutation PSO algorithm. Basing on a special PSO model depicted as “social-only”, the LMPSO adopts a new mutation strategy – limited mutation. When the distance between one particle and the global best location is less than a threshold predefined, some dimensions of the particles will mutate under specific rules. The LMPSO is compared to other five different types of PSO with mutation strategy, and the experiment results show that the new algorithm performances better on a four-function test suite with different dimensions.

MoB4-b-4 **11:30-11:50**

Genetic Particle Swarm Optimization Based on Estimation of Distribution

Jiahai Wang
Sun Yat-sen University, China

Estimation of distribution algorithms sample new solutions from a probability model which characterizes the distribution of promising solutions in the search space at each generation. In this paper, a modified genetic particle swarm optimization algorithm based on estimation of distribution is proposed for combinatorial optimization problems. The proposed algorithm incorporates the global statistical information collected from local best solution of all particles into the genetic particle swarm optimization. To demonstrate its performance, experiments are carried out on the knapsack problem, which is a well-known combinatorial optimization problem. The results show that the proposed algorithm has superior performance to other discrete particle swarm algorithms.

MoB4-b-5 **11:50-12:10**

Particle Swarm Optimization Applied to Image Vector Quantization

Xubing Zhang, Zequn Guan, Tianhong Gan
Wuhan University, China

Codebook design of VQ (Vector Quantization) is a global optimization problem. The LBG algorithm depends upon the initial codebook and is prone to converge to a local optimal solution. To solve the problem, adopt PSO (Particle Swarm Optimization) to design the optimal codebook of image vector quantization and present PSO-VQ (PSO Vector Quantization) algorithm. According to PSO-VQ, a particle indicates a codebook and the optimal codebook is

obtained from iterations of the initial codebooks by method of the particle evolvement. To ensure the solution converge to the global optimal codebook, the authors presented the PCO (Particle Coherent Operation), by which the code vectors of each initial codebook are sorted in ascending order based on the average gray value of the pixels in the code vector, and so that the inner structures of all the particles are essentially identical. The experimental results show that the PSO-VQ algorithm is feasible and effective, as well as develops the application of the PSO.

MoB5-b 8:30-10:10
Room3
Topic: Advanced evolutionary computing theory, algorithms and application-2

MoB5-b-1 8:30-8:50

The evolutionary stability affected by flow of energy in the bio-network architecture

Hongbin Sun1,2, Yongsheng Ding1
1.Donghua University, China
2.Institute of Technology, China

Stability analysis is a significant aspect in the complex network. In this paper we establish a mathematical model to discuss the evolutionary stability based on energy design in bio-network. The measurement of energy entropy and global stability based on Nash equilibrium is proposed. The problems of finding a Nash equilibrium can be formulated as a problem of detecting a global optimization problem, the improved differential evolution algorithm is apply to solve the problem, the simulation of energy stability is provided to validate the method.

MoB5-b-2 8:50-9:10

A methodology to support product platform optimization using multiobjective evolutionary algorithms

Zhongkai Li, Yixiong Feng, Jianrong Tan, Zhe Wei
Zhejiang University, China

Considerable research has been directed towards the development of methods for designing families of products. A Multiobjective Optimization-based Platform Design Methodology (MOPDM) was presented to optimize the individual product performances with a feasible platform commonality level. The process and optimization model for scale-based product platform was constructed firstly, and then the MOPDM was carried out in two stages using Nondominated Sorting Genetic Algorithm II (NSGA-II). A mechanism based on fuzzy set theory was developed to extract one of the Pareto-optimal solutions as the best compromise one. During the first stage of MOPDM, each product in the family was optimized independently with NSGA-II. Those design variables that show small deviations were held constant to form the product platform. The scaling variables of each instance product were optimized in the second stage. The efficiency and effectiveness of proposed method is illustrated by the optimization of scale-based capacitor-run single-phase induction motor families, and the results are compared against previous work.

MoB5-b-3 9:10-9:30

A Population-based Artificial Immune System for Numerical Optimization

Maoguo Gong, Licheng Jiao
Xidian University, China

This paper introduces a model for population-based Artificial Immune Systems, termed as PAIS, and applies it to numerical optimization problems. PAIS models the dynamic process of human immune response as a quaternion (G, I, R, AI), where G denotes exterior stimulus or antigen, I denotes the set of valid antibodies, R denotes the set of reaction rules describing the interactions between antibodies, and AI denotes the dynamic algorithm describing how the reaction rules are applied to antibody population. Some general descriptions of reaction rules including the set of clonal selection rules and the set of immunological memory rules are introduced in PAIS. Based on the reaction rules, a dynamic algorithm, termed as PAISA, is designed for optimization. In order to validate the performance of PAISA, nine benchmark functions with 20 to 10000 dimensions and a practical case, optimal approximation of linear systems are solved by PAISA, successively. The experimental results indicate that PAISA has high performance in optimizing some benchmark functions and practical optimization problems.

MoB5-b-4 9:30-9:50

Cooperative versus Competitive Coevolution for Pareto Multiobjective Optimization

Tse Guan Tan, Hui Keng Lau, Jason Teo
Universiti Malaysia Sabah, Malaysia

In this paper, we propose the integration between Strength Pareto Evolutionary Algorithm 2 (SPEA2) with two types of coevolution concept, Competitive Coevolution (CE) and Cooperative Coevolution (CC), to solve 3 dimensional multiobjective optimization problems. The resulting algorithms are referred to as Strength Pareto Evolutionary Algorithm 2 with Competitive Coevolution (SPEA2-CE) and Strength Pareto Evolutionary Algorithm 2 with Cooperative Coevolution (SPEA2-CC). The main objective of this paper is to compare competitive against cooperative coevolution to ascertain which coevolutionary approach is preferable for multiobjective optimization. The competitive coevolution will be implemented with *K*-Random Opponents strategy. The performances of SPEA2-CE and SPEA2-CC for solving tri-objective problems using the DTLZ suite of test problems are presented. The results show that the cooperative approach far outperforms the competitive approach when used to augment SPEA2 for tri-objective optimization in terms of all the metrics (generational distance, spacing and coverage).

MoB5-b-5 9:50-10:10

A Robot Path Planning Algorithm Based on Evolutionary Algorithm

Xuesong Yan1, Qinghua Wu2, Qingzhong Liang1, Chengyu Hu1, Jia Yan1
1.China University of Geosciences, China
2.WuHan Institute of Technology, China

Robot path planning is a NP problem, traditional optimization methods are not very effective to it, which are easy to plunge into local minimum. Evolutionary Algorithm is a Heuristic Algorithm based on the idea of Darwin evolutionism and Mendel genetics that simulates the process of nature to solve complex searching problems. In this paper, we devise an evolutionary algorithm to solve the robot path planning problems based on some new genetic operators .The problems in algorithm design mainly considered are how to select the evolutionary operators, how to avoid the solutions falling into the local optimal and how to enhance the efficiency of the evolution process and so on. The new algorithm has been carried on the operation to the test examples. The experiment results indicated that the new algorithm is efficiency for solving the robot path planning problems and the best path usually can be found.

MoB5-c 10:30-12:10
Room3
Topic: Advanced evolutionary computing theory, algorithms and application-3

MoB5-c-1 10:30-10:50
Evolutionary Optimization Techniques for Optimal Location and Parameter Settings of TCSC Under Single Line Contingency
G. I. Rashed, H. I. Shaheen, S. J. Cheng
Huazhong University of Science and technology, China
One of the most effective Flexible AC Transmission Systems (FACTS) devices is the Thyristor Controlled Series Capacitor (TCSC) which can smoothly and rapidly change its apparent reactance according to the system requirements. This paper deals with the application of Genetic Algorithm (GA) and Particle Swarm Optimization (PSO) for finding the optimal location and the optimal parameter settings of TCSC under single line contingency (N-1 Contingency). Contingency analysis is performed to detect and rank the severest line faulted contingencies. To validate the proposed techniques, simulations are performed on an IEEE 6–bus and an IEEE 14–bus power systems. The obtained results are encouraging, and show that TCSC is a very effective series compensation device that can significantly eliminate or minimize line overloads against single contingencies.

MoB5-c-2 10:50-11:10
An Artificial Life Computational Model for the Dynamics of Agro-ecosystem
Li Sa1,3, Fanlun Xiong2, Yongsheng Ding1
1.Donghua University, China
2.Institute of Intelligent Machines, CAS, China
3.Jimei University, China
Artificial life computational model can be used to simulate the dynamic behavior of certain agro-ecosystem. In this paper, we present an agent-based artificial agro-ecosystem model to simulate the interaction between pest movements and trap crop physical design. The result of simulation shows that artificial agro-ecosystem model has a broad application prospect in the field of agro-ecosystem management.

MoB5-c-3 11:10-11:30
On the Running Time Analysis of the (1+1) Evolutionary Algorithm for the Subset Sum Problem
Yuren Zhou1, Zhi Guo1, Jun He2
1.South China University of Technology, China
2.University of Birmingham, UK
Theoretic researches of evolutionary algorithms have received much attention in the past few years. This paper presents the running time analysis of evolutionary algorithm for the subset sum problems. The analysis is carried out on (1+1) EA for different subset sum problems. It uses the binary representation to encode the solutions, the method “superiority of feasible point” that separate objectives and constraints to handle the constraints, and the absorbing Markov chain model to analyze the expected runtime. It is shown that the mean first hitting time of (1+1) EA for solving subset sum problems may be polynomial, exponential, or infinite.

MoB5-c-4 11:30-11:50
Computational Method & Simulation in Life System
Min Gong, Minrui Fei, Guosen He
Shanghai University, China
This paper presents the Computational Methods and Simulation and Modeling in Life System as a bird-eye-view, which includes Traditional Chinese Medicine and foreign achievements. There are five great categories of CMSLS and also a number of applications in clinics. The 10 Emerging Science and Technologies 2007 of MIT’s 2007 Technology Reviewer Magazine had Shown the basic biology and CMSLS are very important goals of us nowadays.

MoB5-c-5 11:50-12:10
A Random Velocity Boundary Condition for Robust Particle Swarm Optimization
Jian Li, Bo Ren, Cheng Wang
Huazhong University of Science & Technology, China
The particle swarm optimization (PSO) is a stochastic evolutionary computation technique based on the behavior of swarms that can be used to optimize objects with complex search spaces. However, it has been observed that its performance varies duo to the dimensionality of the object and the location of the global optimum in the search space. This paper introduces a “random” velocity boundary condition to address the problem, where the velocity boundary alters randomly to prevent the velocity of a particle from stopping on a same boundary during the evolution. Simulation results on two benchmark functions with 30 and 300 dimensionalities and three types of locations of the global optimum solutions in the search spaces have shown that with the proposed “random” velocity boundary condition, a highly competitive optimization performance can be obtained for PSO regardless of the dimensionality and the location of the global optimum solution.

MoB8-a 8:30-10:10

Room4
Topic: Advanced neural network theory, algorithms and application-1

MoB8-a-1 **8:30-8:50**

Two-stage Gene Selection for Support Vector Machine Classification of Microarray Data

Xiao-Lei Xia, Kang Li, George W. Irwin
Queen's University Belfast, UK

This paper proposes a new stable gene selection method for support vector machines (SVM) classification of microarray data, aiming to improve the classification accuracy. A two-stage algorithm is used to select genes, leading to the construction of a compact multivariate linear regression model, which contains only genes less than the number of experiments as well as a weight vector for each gene index. The SVM then learns the microarray data based on this linear regression model. The experimental results, from two well-known microarray data sets, show that the SVM with two-stage gene selection maintains a consistently high accuracy with a small number of genes. It is also shown that the proposed method outperforms the two other typical gene selection methods – Baseline Method and Significant Analysis of Microarrays in terms of accuracy.

MoB8-a-2 **8:50-9:10**

Research of applying SVM and attributes reduction of RS based on EA into Short-term electricity load forecasting

Jingmin Wang, Liping Wang
North China Electric Power University, China

Accurate forecasting of short-term electricity load has been one of the most important issues in electricity industry. To enhance the accuracy of forecasting results, many forecasting techniques and models have been presented by researchers, such as SVMSA model and the traditional SVM model. This attempt integrates the attributes reduction of Rough Set (RS) based on Evolutionary Algorithm (EA) and support vector machines (SVM) into traditional load forecasting technique to form a new forecasting model, which has been proved to be able to enhance the accuracy, improve the convergence ability and reduce operation time by numerical experiment. The results of numerical experiment also indicate that the new model outperformed the other two models proposed by some researchers. There are many causes for new model to have so superior performance. Firstly, the attributes reduction of RS based on EA not only reduce the input variables of SVM, but also can assure that the gained reduction have fewer attributes and higher support degree by introducing punishing function into fitness function, which can improve the search effect. Secondly, the convergence ability is improved by integrating relative core into EA. Moreover, the traditional SVM model and the SVMSA Model also lay a good basis for this study. The proposed model is expected to offer a valid alternative for application in the load forecasting field.

MoB8-a-3 **9:10-9:30**

Research on Nonlinear Time Series Forecasting of Time-Delay Neural Network Embedded with Bayesian Regularization

Weijin Jiang1,2, Yuhui Xu3
1.Hunan business college, China
2.Wuhan University of Technology, China
3.Central South University, China

Based on the idea of nonlinear prediction of phase space reconstruction, this paper presented a time delay BP neural network model, whose generalization capability was improved by Bayesian regularization. Furthermore, the model is applied to forecast the imp&exp trades in one industry. The results showed that the improved model has excellent generalization capabilities, which not only learned the historical curve, but efficiently predicted the trend of business. Comparing with common evaluation of forecasts, we put on a conclusion that nonlinear forecast can not only focus on data combination and precision improvement, it also can vividly reflect the nonlinear characteristic of the forecasting system. While analyzing the forecasting precision of the model, we give a model judgment by calculating the nonlinear characteristic value of the combined serial and original serial, proved that the forecasting model can reasonably 'catch' the dynamic characteristic of the nonlinear system which produced the origin serial.

MoB8-a-4 **9:30-9:50**

An Edge-Finding Algorithm on Blind Source Separation for Digital Wireless Applications

Jie Zhou1, Keyou Yao1, Ying Zhao1, Yiyue Gao1, Hisukazu Kicuchi2
1.Nanjing University of Information Science and Technology, China
2.Niigata University, Japan

In this paper we discuss the problem of blind estimating multiple digital co-channel communication signals using an antenna array. A new approach is proposed to the problem, which is to find all the independent edges of X base on analysis of the projections of X onto coordinates. Through the simulation results of separating two blind audio signals, we can find out that blind signals could be separated with the algorithm quickly and rightly.

MoB8-a-5 **9:50-10:10**

A Design of Self Internal Entropy Balancing System with Incarnation Process

JeongYon Shim
Kangnam University, Korea

In this paper, adopting the concept of autonomic nervous system, we design Self Internal Entropy Balancing System with incarnation focused on the self maintaining function, we define self type and self internal entropy as a property of system. This system checks SEG(Surviving Energy Gauge) periodically and make a balance by adjusting the treatment. In the case of the situation to survive, it keeps the system by processing the incarnation process. It is applied to knowledge network system of virtual memory and tested with sample data.

MoB8-b 10:30-12:10
Room4
Topic: Advanced neural network theory, algorithms and application-2

MoB8-b-1 10:30-10:50
DNA Coding Method and Neural Network Based Hybrid Fuzzy System for Backward Movement of Truck-trailer
Jang Hyun Kim, Jin Bae Park, Hyunseok Yang
Yonsei University, Korea
In the construction of successful fuzzy models and/or controllers for nonlinear systems, identification of a good fuzzy inference system is an important yet difficult problem, which is traditionally accomplished by a time-consuming trial-and-error process. In this paper, we propose a systematic identification procedure for complex multi-input single-output nonlinear systems with DNA coding method. DNA coding method is optimization algorithm based on biological DNA as are conventional genetic algorithms (GAs). We also propose a new coding method for applying the DNA coding method to the identification of fuzzy models. To acquire optimal TS fuzzy model with higher accuracy and economical size, we use DNA coding method using neural network to optimize the parameters of fuzzy inference system.

MoB8-b-2 10:50-11:10
A Robot Path Planning Algorithm Based on Neural Network for Window Cleaning
Meiting Wang, Shili Tan, Haihong Zhang
Shanghai University, China
This paper presents a novel approach for complete coverage path planning (CCPP) of wall cleaning robots in an unknown workspace. Complete coverage path planning is a special kind of path planning, which requires the robot path to cover every part of the workspace. In order to do so, we proposed a combined algorithm of the exact cellular decompositions method, and the neural network method in this paper. According to the actual working environment of the wall-cleaning robot, a local map composed of squared cells is built through the proposed exact cellular decompositions method with limited sensory information in unknown environments. To generate a complete coverage navigation path without prior information of the environment, the window frame following navigation was first performed to correct the pose and moving direction of the robot. To find the uncovered region and determine the local direction, the neural network was adopted. The robot is able to dynamically build an accurate map of its immediate limited surroundings for its navigation. The dynamics of each neuron in the topologically organized neural network is characterized by a shunting equation derived from membrane equation of Hodgkin and Huxley. The robot can only sense a limited measurable range and the obtained sensory information are used for its navigation. The feasibility of the proposed algorithm is validated by simulation studies on cases under known and unknown outdoor wall environments.

MoB8-b-3 11:10-11:30
ART2 Neural Network Interacting With Environment
Jian Fan1,2,3, Yang Song1,2, MinRui Fei1,2
1.Shanghai Key Laboratory of Power Station Automation Technology, China
2.Shanghai University, China
3.Nanjing Army Command College, China
This paper proposes a novel neural network called reinforcement learning based adaptive resonance theory (RL-ART2) which is capable of online learning through alternating with environment; also presents its learning algorithm. In RL-ART2, ART2 is used to store abundant classified patterns and state space, but faced large classified patterns, it is an impossible task to spend large time on evaluating and selecting every classified pattern by hand, so reinforcement learning is imported into ART2 to solve how to evaluate and select ART2 classified pattern by using its alternation ability with environment. After ART2 gets the winning classified pattern and it is running in actual environment, reinforcement learning evaluates the running result of ART2 classified pattern. If the running result is ideal, then ART2 encourages the classified pattern, viz. increases its corresponding weights, else punishes the pattern, and viz. decreases its corresponding weights. When the neural network completed certain learning times, it will be possessed comparative distinguish probability through interactive learning with environment. The simulation experiment of cooperative portage of mobile robot indicates that the collision number between robot and obstacles is effectively decreased by RL-ART2. RL-ART2 makes favorable result of cooperative portage.

MoB8-b-4 11:30-11:50
An Agent Reinforcement Learning Model Based on Neural Networks
Lianggui Tang1,2, Bo An3, Daijie Cheng2
1.Chongqing University, China
2.Chongqing Technology and Business University, China
3.University of Massachusetts, USA
This paper thoroughly analyzes the transfer and construction of the state-action space of the agent decision-making process, discusses the optimal strategy of agent's action selection based on Markov decision-making process, designs a neural networks model for the agent reinforcement learning, and designs the agent reinforcement learning based on neural networks. By the simulation experiment of agent's bid price in Multi-Agent Electronic Commerce System, validated the Agent Reinforcement Learning Algorithm Based on Neural Networks has very good performance and the action impending ability.

MoB8-b-5 11:50-12:10
Dynamic Structure-based Neural Network Determination Using Orthogonal Genetic Algorithm with Quantization
Liling Xing1, Wentao Zhao2
1.National University of Defense Technology, China
2.Chengdu Institute of Computer Applications, CAS, China
It proposed a novel dynamic structure-based neural network determination approach using orthogonal genetic

algorithm with quantization in this paper. Both the parameter (the threshold of each neuron and the weight between two neurons) and the transfer function (the transfer function of each layer and the network training function) of the dynamic structure-based neural network were optimized in this proposed approach. In order to satisfy the dynamic transform of the neural network structure, the population adjustment operation was introduced into orthogonal genetic algorithm with quantization for dynamic modification of the population's dimensionality. A mathematical example was applied to evaluate this proposed approach. The experiment results suggested that this proposed approach is feasible, correct and valid.