BOOK OF ABSTRACTS

SuA1-a
13:30-15:30
Room1
Topic: Modeling Theory and Technology-1

SuA1-a-1
An Investigation on the Flow Field of a Vortex Cup
Xin Li 1, Shoichiro Iio 2 and Toshiharu Kagawa 1
1 Precision and Intelligence Laboratory, Tokyo Institute of Technology, Japan
2 Dept. of Environmental Science and Technology, Shinshu University, Japan
Abstract. This work presents a computational fluid dynamics (CFD) calculation to investigate the flow field of a vortex cup. The vortex cup utilizes air swirling flow to achieve handling a work piece without any contact. The numerical calculation was performed using the standard k-ε model and Reynolds stress model (RSM), and the pressure distribution calculated numerically was compared with the experimental results. It is found that RSM can better reproduce the characteristics of experimental results than the standard k-ε model. Based on the calculation results of RSM, the flow field, spatial pressure and velocity distributions inside the vortex cup were clarified. Furthermore, a visualization experiment was conducted by using ink in water with an enlarged cup, in which the flow was observed and confirmed.

SuA1-a-2
Research on Behavior Model of Virtual Soldier
Qing Xue[1], Qing Deng[1], Jian Sun [1], and Huibo Gao[1]
1 Academy of Armored Force Engineering, Beijing, China
Abstract: In the Urbanized Terrain Simulation, it is an important task to build behavior model of virtual soldier for virtual city and to achieve independent actions. An object-oriented behavior model of virtual soldier, which has simple and comprehensive structure, is proposed in this paper. It includes basic reaction hierarchy, control hierarchy and object-oriented behavior hierarchy. And detailed action choice rules, hierarchy configuration and inner state model behavior of the behavior model are presented. The model is implemented based on the method of coalescent pattern to simulate veritably soldier behavior.

SuA1-a-3
Analysis of Aperture Shape Changing Trend Base on the Shaped Charge Jet Penetration through the Steel Target
Junqing Huang[1], Yalong Ma[1], Kelei Huang[1], and Jianxun Zhao[1]
1 Department of Equipment Command and Administration Academy of Armored Force Engineering, China
Abstract: Based on the characteristic of the linear shaped charge and the theory of jet penetration target, a method, which adopts explicit dynamic analyzing program AUTODYN to simulate the process of the linear shaped charge jet penetration through the target, is proposed in this paper. The trend and rule of aperture size changing with time during the process of the jet penetration the target, are analyzed. The physics phenomena and rule are basically same between emulational result and testing result. It shows that analytical model and emulational method are reasonable and practical.

SuA1-a-4
A Commanding Model of Counterwork Simulation System Based on Value Driving Decision-making
Weifeng Li[1], Shuli Wang[2], Xinjun Zhao[1], and Jiying Wang[1]
1 Institute of Special Vehicle, No.6 Lab,No.3 Yuan, Fengtai District,
2 Academy of Armored Force Engineering, Fengtai District, China
Abstract. A commanding model of counterwork simulation system based on value driving decision-making is proposed in this paper. The theoretical foundation of the method is Nash Equilibrium of game theory. This paper analyzes the value driving decision-making model which is based on entity's maximum benefit and gives examples of value driving decision-making in the Counterwork Simulation System.

SuA1-a-5
Research on Assembly Line Modeling and Simulation Optimization
Fuli Huang[1], Wenhua Zhu[1], Bin Bai[1], and Baorui Li[1]
1 CIMS and Robot Center, Shanghai University, China
Abstract. In this paper, assembly line is discussed with plant simulation. Firstly, the method of assembly line modeling is proposed. Secondly, assembly line simulation optimization is researched. Finally, assembly line modeling and simulation optimization are both described by an instance.

SuA1-a-6
Research and Simulation on Template Surface Construction and Orthogonal Curvature Extraction
Hesheng Zhang[1,2], Xiaoping Qiao[1], Ping'an Ding[1], and Xiaojin Zhu[1]
1School of Mechatronics Engineering and Automation, Shanghai University,China
2 Shanghai Institute of Aerospace Electronic Technology, China Aerospace Science and Technology Corporation,China
Abstract. In this paper, face to surface fitting algorithm based on orthogonal curvature is

proposed, and then with the help of related theories of differential geometry, the template surface can be constructed based on arc tangent function. Then, the method of extracting curvature on equal arc meshes and the method for numerical solution of nonlinear equations are analyzed. Besides, with the help of computer software technology and computer graphics library technology, a software simulation platform is firstly built, and then the construction of arc tangent rotating surface, the extraction of orthogonal curvature and the 3D rendering of template surface and fitting surface are successfully realized. The operation effect of software simulation platform shows that the construction algorithm of template surface, the extraction algorithm of orthogonal curvatures and the method for numerical approximation can effectively construct template surface and extract orthogonal curvature accurately. These algorithms can provide basic technical support for the simulation and experimental verification of surface fitting algorithm based on orthogonal curvature.

SuA1-a-7

BOM Ontology-based Composite Modeling Approach for Simulation Model

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1 Marine College of Northwestern Polytechnical University, Xi'an, China;
2National Key Laboratory of Underwater Information Process and Control, Xi'an, China
3Aeronautics & Astronautics Engineering College, Air Force Engineering University, Xi'an, China

Abstract. It is an efficient way for developing models by composition of reusable components. Successful composition of models means correct in both syntactic and semantic level. Base Object Model (BOM) facilitates and improves the semantic information of simulation model, and its purpose is to improve reusability and composition. However, there is no sufficient information for BOM matching in semantic level because that BOM has no rich and clear semantic information. In this paper BOM ontology is built to enhance BOM semantic information leaving the BOM unaltered by using ontology and an iterative approach is proposed to reduce the complexity of composition. The approach mainly consists of three phases: transformation from conceptual model to event classification model; model search; model matching and composition. Finally, we demonstrate this through a simple simulation system. The result shows that this approach is effective and can simplify the composition of ontologies.

SuA1-a-8

Research on IDEF0 and UML Combination Based Modeling of Equipment Support

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2 Naval Academy of Armament Beijing, China

Abstract. The concept and merit of the simulation for equipment support is expatiated, and the requirement of modeling and simulation of the equipment support systems is analyzed. And then, a method for modeling of the equipment support systems is proposed which combines the IDEF0 and UML methods. With the navy equipment support as an example, a design of the simulation structure is introduced, and the model of a selected typical support activity is characterized graphically. A research method is provided for modeling and simulation of equipment support, which establish a foundation for farther simulation study of the equipment support.

SuA1-a-9

Interactive Data Encryption Strategy for Distributed Simulation System

Lin Xin1, Shi Weihui2
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Abstract： The distributed simulation system interoperation can be divided into six levels. Interactive data encryption can be completed in each level, lead to six encryption strategies: data field encryption, data package encryption, simulation application encryption, simulation node encryption, and simulation system encryption. Large and Complex distributed simulation system may employ one or several encryption strategies above.

SuA1-b
15:50-18:10
Room1
Topic: Modeling Theory and Technology-2

SuA1-b-1

Design of Intelligent UUV Model Based on the Command Mechanism

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1 School of Marine, Northwestern Polytechnical University, Xi'an, China;
2 National Key Laboratory of Underwater Information Process and Control, Xi'an, China

Abstract. Compared with traditional BDI structure Agent which is controlled by individual consciousness to accomplish tasks, Multiple UUV combat receives command from carrier or submarine and takes action according to its surrounding information. Combined with research works from Agent theory and military combat command system, this paper brings up a structure which is based on Agent model and illustrates the formula language to build up the command oriented intelligent UUV model. UUV model realized the MAS UUV Fleet Combat simulation system and provide technical support to the realization of MAS underwater network

centric warfare systems.

SuA1-b-2

Analysis of Vacuum Casting Pressure Time and its Influence on Casting Quality

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2. Shanghai Key Laboratory of Mechanical Automation &Robotics Shanghai University, China

Abstract. Differential pressure vacuum casting process exist some characteristics, such as nonlinear, time-varying, lag and so on, which is a dynamic process with parameter changing. In the casting process, in order to make parameters meet requirements, the compression model of casting system must be analyzed correspondingly. Pressure time formula of compression process is derived by means of vacuum technology theory, and V450N-VD Vacuum Casting Machine designed by Shanghai University is used to do experiments and its results show that the cross-sectional area of inlet valve and the initial pressure of vacuum chamber are the important parameters of affecting pressure time during compression process. With the motorcycle headlight shell as the experimental mold during the vacuum casting process, experiments show that reasonable pressure time is beneficial to improving the casting quality during the compression process.

SuA1-b-3

Role-based Vehicle-level CGF Entity Model Code Framework

Xiao Song[1], Xuecheng Shi[1], Guanghong Gong[1], Lidong Qian[1], and Shaoyun Zhang[1]
1 Science and Technology on Aircraft Control Laboratory, School of Automation Science, Beihang University, China

Abstract. Vehicle-level CGF entity model with high intelligence usually has very complex logic programming code architecture. Nowadays most simulation model generating tools can not generate CGF entity models efficiently. To overcome this shortcoming, we propose a XML based role configurable and reusable code framework. It consists of command part and action part, corresponding to behavior model and physical model respectively. The configurable assembling module assembles the two parts and forms the CGF entity. Preliminary application verifies that the code frame can satisfy the real-time requirement of current large scale system-of-systems CGF simulation, having good configurable and reusable properties.

SuA1-b-4

QVGA OLED Display Control Module with High Gray-level

Meihua Xu[1], Shihao Weng[1], and Mengwei Sun[1]
Shanghai University, Shanghai, China

Abstract. OLED has a lot of advantages like simple structure, ultrathin, self-luminescence, high brightness, short response time, wide viewing angle, low operation voltage and so on, which is widely applied in cell phone, PDA, DC, on board display and military field. This paper represents a real-time video display system on OLED based on the detailed analysis of OLED panel electrical characteristics and various gray scale scanning principles of the OLED scan and drive circuit. FPGA is the core control device in the whole system, the DVI decoded signal is processed and real-time displayed on the OLED. 240×RGB（H）×320（V）QVGA, 256 gray scale is implemented and frame frequency is 60Hz~100Hz. The power drive has 7 outputs, which is adjustable to fit the external environment. Among them, sub-field scanning working mode is adopted in the design, gray scale is selectable.

SuA1-b-5

Wave-based Reflections Reducing Approach for Bilateral Teleoperation

Min Zheng[1], Wei Xiao[1], and Qinghai Chen[1]
1College of Mechatronic Engineering and Automation, Shanghai University,Shanghai Key Laboratory of Power Station Automation Technology,Shanghai, China

Abstract. The wave-based method can guarantee the passivity of the bilateral teleoperation system, but the ensuing wave reflections will deteriorate the operation performance. This paper presents a new wave-based bilateral teleoperation structures to attenuate the wave reflection, at the same time, by scaling the structure parameters to improve the force and speed tracking performance. And according to the wave scattering theory, passivity of the new structure is analyzed. Experiments show that the proposed method not only guarantees the stability of the system, but also improves the position tracking and force feedback performance.

SuA1-b-6

Recovering Three-dimensional Surfaces with Multi-images Shape-from-shading Method

Lei Yang[1] and Ning Zhang[1]
1School of Mechatronic Engineering & Automation, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China

Abstract. Three-dimensional (3-D) shape reconstruction is one of the fundamental problems in the field of computer version. Most existing shape-from-shading (SFS) methods are based on signal image and orthogonal projection. But the reflectance map equation is a nonlinear partial differential equation about two random variables. So the SFS is an ill-posed problem. Further more, orthogonal projection used to simulate the imaging processes of camera is not very accurate. This paper proposes a new SFS method under perspective projection with multi-images. Three images with different lighting source directions are captured by camera firstly. Following three reflectance map equations which are described by Lambertain model are

established. Then the gradient vectors of the 3-D surface are calculated by solving the reflectance map equations. The gray constraint and gradient component constraint conditions are used to construct target function, and the corresponding Eulor-Poision equations are derived. Simultaneously, discrete difference is used to approximate differential operation. New iterative 3-D shape reconstruction algorithm is proposed by the discrete difference equation. Three pixel values are used to solve certain gradient value in our method. So the ill-posed problem in traditional SFS which solves a single reflectance map equation can be avoided. At last, experimental results of 3-D reconstruction show that the proposed method is effective.

SuA1-b-7

Balancing Methods on the Three-axis Air-bearing Platform

Shuai Wang[1], Jie Ma[1], and Shuang Gao[1]
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Abstract. In order to improve the performance of the three-axis air-bearing platform (TAP) and to achieve higher simulation accuracy, better balancing methods are required. In this paper, we propose a complete balancing method considering other kinds of disturbance torque as well as the gravity torque.The gravity torque adjustment is divided into three steps: manual adjustment, rough automatic adjustment and precise automatic adjustment. Other kinds of disturbance torque, such as vortex torque, elastic distortion torque and dynamic unbalance torque are discussed. The effectiveness of the proposed method is validated through experiments.

SuA1-b-8

A Non-linearity Correction Method for Calibration of Optical Sensor at Low Level Light

Zilu Wang[1], Bin Wu[1], and Tima Sergienko[2]
1 Beijing Aeronautical Science & Technology Research Institute(BASTR),COMAC, China
2 Swedish Institute of Space Physics, Kiruna, SE 98128, Sweden

Abstract. This paper describes a methodology developed for calibrating optical detector for light engineering, especially for devices used at low level light, including auroral imager, star sensor, astronomical camera and similar optical instruments. In order to know the physical meaning of optical sensor output, calibration is the first and most important process in a complete analysis of observed data. It is found that optical sensors, like CCDs, are not perfectly linear systems as they were assumed. After bias frame subtraction, the number of ADU counts is not exactly proportional to the number of incident photons. A key component of this paper is non-linearity correction. One of current applications using this method is auroral imager which is used for measuring aurora, high-altitude clouds, and other atmospheric optical objects light intensity, which is the first step to complete an optical object tomography simulation.

SuA1-b-9

Analyzing Effects of Ankle-Foot Parameters on Passive Bipeds Based on Dynamic Walking Modeling

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1School of Automation Science and Electrical Engineering,Beihang University, China
2Intelligent Control Laboratory, College of Engineering,Peking University, China

Abstract. Though people's usual gaits tend to be natural and simple, the theoretical modeling and analysis are complicated based on the remarkable fact that the walking motion is a complex dynamic phenomenon. In this paper, we build a passive dynamic bipedal walking model with °at feet and compliant ankle joints. The bipedal walker travels on a slope actuated by the gravity. We analyze e®ects of ankle-foot parameters on walking characteristics based on dynamic walking modeling. Simulation results demonstrate that the model can perform stablewalking cycle. The e®ects of ankle-foot parameters on motion characteristics with different ankle stiffness are shown in detail.

SuA1-b-10

Comprehensive evaluation of vehicles-track system status for high-speed railway based on the Generalized Energy Index method

Li Hui, Tianyuan Xiao
State CIMS Engineering Research Center,Tsinghua University.China

Abstract. TQI is used to evaluate the track irregularity by many countries, but it ignores the impact of different wavelength components of the energy in the track irregularity. This article describes the principle of Generalized Energy Index method at first, then presents the improved the GEI's calculation method. The results of simulation experiments have shown that GEI is better for the evaluation of track irregularity than TQI. Also, using the track data from VAMPIRE and MATLAB software, a series of simulation analysis has been carried out, and has worked out that at high speed, the faster the vehicle operating speed, the impact of long-wavelength irregularity was greater in the vehicle dynamic response. These results provide theoretical support for the maintenance of the tracks when the trains speed.

SuA1-c
13:30-15:30
Room2
Topic: Modeling Theory and Technology-1

SuA1-c-1

Investigation of Eddy Diffusivity in a Reactive Plane Jet by Using Direct Numerical Simulation

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Hiroki Suzuki3, and Toshiyuki Hayase4
1, 2 Nagoya University, Nagoya, Japan
3 Nagoya Institute of Technology, Nagoya, Japan
4 Tohoku University, Sendai, Japan
Abstract. Eddy diffusivity in a planar turbulent jet with a second-order chemical reaction ( ) is investigated by using direct numerical simulation. Reactant A and B are premixed into the jet flow and the main flow, respectively. The eddy diffusivity of species A on the jet centerline is calculated from the mean concentration of species A and the streamwise turbulent mass flux of the species A. The results show that the chemical reaction makes the eddy diffusivity of species A small, and the effects of the chemical reaction on the eddy diffusivity depend on the Damköhler number. From these results, we can conclude that the gradient diffusion model should be used with considerations of the effects of chemical reactions on eddy diffusivity.

SuA1-c-2

A Design Method of Derivative State Constrained H_2 Integral Servo Controller for Suppressing under Damping of Oscillatory System

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1Graduate School of Science and Technology, Shizuoka University, Japan
2Faculty of Information Scinece, Aichi Institute of Technology, Japan
3Professional Graduate School of Embedded Technology, Tokai University, Japan
Abstract. A design method in this paper concerns the optimal H2 integral servo problems for two-inertia model via the constraints of the derivatives of state variables added to the standard constraints. It is shown in the paper that the derivative state constrained optimal H2 integral servo problems can be reduced to the standard optimal H2 control problem. The main subject of the paper is to derive the derivative the theorem for state constrained H2 integral servo. The effect of our proposed controller with respect to reduce an under damping for two-inertia model system is also verified.

SuA1-c-3

A Temporal Coherence Based Framework for Visualizing Time-varying Unstructured Volume with PBVR

Kun Zhao1, Naohisa Sakamoto2, and Koji Koyamada2
1 Graduate School of Engineering, Kyoto University, Japan
2 Institute for the Promotion of Excellence in Higher Education, Kyoto University, Japan
Abstract.Time-varying visualization is always an important topic in the field of scientific visualization. Due to the large data size and complex grid, the unstructured time-varyingvisualization is still a hard problem. In this paper, we propose atemporal coherence based framework for visualizing large-scale time-varying unstructured volumewith the Particle-based volume rendering (PBVR).PBVR is a visibility sorting free rendering method, which can render a large-scale unstructured grid dataset efficiently. However, the pre-process of PBVR, which is to generate particles from the original volume, can always cost too much time. To overcome this problem, we utilize the temporal coherence between consecutive time steps to decrease the particle generation time.After the particle generation, we also compress the particle data before it is stored in hard disk. In account of the compressed data size, the loading time of the particle data during the rendering process is decreased obviously.And after the loading of the particle data, our system can render the data as an animation very smoothly by utilizing the LOD control of PBVR.We applied our system to rendering of 465 time steps of 3,676,828 hexahedral cell grid dataset to confirm the effectiveness.

SuA1-c-4

Detection of Linear Relationship Among Dimensions in Multivariate Data by Parallel Coordinates

Chi Zhang[1], Naohisa Sakamoto[1], and Koji Koyamada[1]
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Abstract. When visualizing multivariate data as parallel coordinates, although it is convenient to view the relationship between two adjacent dimensions, the exploring of the relationships among three or more nonadjacent dimensions is relatively difficult. In this paper, we propose a way to solve this problem by using axis-translation method and axiscomparison method, which can keep the original positions of axes and exploring the relationships among three or more nonadjacent dimensions.

SuA1-c-5

VNSP: A Virtual Network Based Simulation Platform

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Abstract. Network based simulation is playing an important role in information technology research fields. However, some simulation activity such as information security test may cause unexpectable breakage to the network infrastructure. In order to overcome these drawbacks and provide more flexible simulation networks, a virtual network based simulation platform named VNSP is designed and implemented. Based on system virtualization technology and software routing methods, the platform has the function of real network infrastructure, can build the target network according to simulation task rapidly. This paper discussed the virtual granularity, system design and system implement of the simulation platform. In the end, a serious of experiments was carrying out to exam the performance of the platform.

SuA1-c-6

A Multi-Resolution Display Method for Digital Archives of Cultural properties using Polygon Reconstruction

Megumi Okumoto1, Yuri Iwakata1, Asuka Komeda1, Tomoko Yonezawa2,Masami Takata1, and Kazuki Joe1
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2 Kansai University, Takatsuki, Osaka, Japan

Abstract. In this paper, we propose a multi-resolution display method for digital archives of cultural properties using polygon reconstruction.When digital archives of cultural properties are displayed in VR systems for research purpose, mesh resolution had to be changeable on the demand of user. Additionally, for user's comfortability, polygon reconstruc-tion needs to be executed in real-time. History of preliminary polygon reductions is adopted for the proposed method so that polygon reconstruction is executed in real-time. To validate the VR system using the polygon reconstruction based multi-resolution display method, some experiments are performed. As the result of the experiments, the proposed method is performed within 1.0 second, which is considered as "realtime" by the de¯nition of typical user-interface.

SuA1-c-7

A Prototype Architecture for Assembly-Oriented Cyber-Physical Systems

Jietao Dong 1, Tianyuan Xiao 1, and Linxuan Zhang 1,
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Abstract. ACPS is a new generation intelligent system based on the embedded systems, sensing technology and networked connectivity. As a typical application of CPS, it has many special features different from the traditional systems. According to these features, a four-layer architecture is proposed which consists of Physical Layer, Network Layer, Co-processing Layer and Application Layer. Furthermore, some research directions and challenges of ACPSs are suggested, and the ultimate goal is to develop foundations and techniques for building safe and effective ACPSs.

SuA1-c-8

Simulation Research of Active Vibration Control for Elastic Missile with Swing Nozzle Thrust Vector Control 3

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2. Beijing Institute of System Engineering,China

Abstract—Aiming at the deficiencies of notch filters on the aspect of vibration suppression to elastic missile with swing nozzle thrust vector control (SNTVC), an active vibration controller (AVC) is proposed. It is composed of an optimal state feedback controller (OSFC) and a minimal order state observer (MOSO), which can be respectively designed based on the separation principle. Computer simulation shows that AVC can realize better vibration suppression, without beforehand measurement or online evaluation on frequency of vibration modal, which results in higher reliability. Moreover, it has simple design and then it is easily implemented in engineering. In addition, the AVC scheme can also resolve the poor system stability to a great extent, which is resulted from the bad static stability of elastic missile.

SuA1-d
15:50-18:10
Room2
Topic: Modeling Theory and Technology-2

SuA1-d-1

An Efficiency driven Deterministic Optimization Approach for Sensor Placement in Image

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2 Research Institute of Local Industries and Economy, Japan
3 Institute for Advanced Study of Mathematical Sciences (MIMS), Meiji University,, Japan

Abstract. In forest management, one key objective of forest field measurement is to measure the Diameter at Breast Height (DBH) of each tree in a specified area. Nowadays the widely employed way is to measure the trees manually one by one which usually takes several days. However much work can be considerably saved by adopting image based measurement approach which includes several steps. Among these steps, careful planning of the sensor placement is an essential preparation step which has significant impact on the effectiveness of the following steps. In this paper, a concept named Trees Per Location (TPL) is proposed to evaluate the efficiency in sensor placement. Based on TPL, we present a novel automatic sensor placement algorithm suitable for image based forest field measurement. The key feature of the proposed algorithm is that the impact of the camera orientation on optical constraints is attenuated due to the fact that in outdoors, the orientation of camera is not easy to control compared with the location of camera. Our method generates a plan composed of a series of sensor viewpoints and a shortest path that traverses each viewpoint exactly once. The plan guarantees that the total number of images needed to be taken is minimum and the travel distance of the path is the shortest while our plan satisfies the constraint that each tree appears in at least one image without being blocked by any other trees. Experiments are carried out on a sample forest from the PlotNet database and a real forest in order to compare the proposed TPL with other mainstream algorithms and validate the proposed method for DBH measurement.

SuA1-d-2

hMETIS-based Offline Road Network Partitioning

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Abstract. Distributed transportation simulation is an important technology for evaluating large-scale traffic applications and control policies, before they are implemented in real-world traffic systems. Offline road network partitioning is the first step towards distributed transportation simulation. Currently, road network portioning algorithms, like METIS, are designed to reduce the execution time. However, a slower execution time is acceptable for offline road network partitioning, if it leads to more efficient road network partitions. This paper introduces hMETIS-based offline road network partitioning. One experiment based on Singapore expressways shows that compared with the famous METIS-based offline road network partitioning, hMETIS-based offline road network partitioning reduces the number of vehicles crossing partitions by 9.8% on average, with a similar load imbalance and an acceptable execution time. For distributed traffic simulations, where there are large amount of data exchanged between partitions, hMETIS-based offline road network partitioning is one candidate solution to reduce the simulation time and increase the scalability.

SuA1-d-3

Exploring a P2P Based Collaborative Feature Modeling through a Procedural 3D CAD Language

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2Institute for Advanced Study of Mathematical Sciences(MIMS),Meiji University, Japan

Abstract. Real time collaborative feature-based CAD modeling within geographically dispersed participants is one of the current research hot spots in collaborative design community. Most existing collaborative design prototypes are based on C/S network architecture which has some weaknesses, such as a single point of failure and bottlenecks, low expansibility and higher maintenance costs. This paper proposed a more effective and efficient scheme of real time collaborative parametric feature-based CAD modeling through concurrently programming 3D CAD model macro file with a procedural 3D CAD scripting language within a P2P (Peer-to-Peer) based collaborative editing system of our PRC platform, developed on the top of an improved JXTA. This paper describes the hybrid P2P network infrastructure, the procedural 3D CAD language, and a hierarchical, dynamic locking approach for consistent maintenance in P2P based collaborative editing. The rudimentarily developed prototype has verified that the proposed scheme is feasible.

SuA1-d-4

Development of Software Module for Model Reference Adaptive Control Simulation Based on the LabVIEW

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Abstract：Missile attitude control system usually adopts fixed gain with feedback control and the design method of combining with using the classical autopilot approach. But the missile's dynamic characteristics and parameters varies with the environment changes dramatically, the traditional method is sometimes hard to meet the guidance performance requirements. According to the missile control system as the research object, based on the theory of adaptive control of missile attitude stabilization loop control method, and LabVIEW control simulation development environment to achieve the model reference adaptive control simulation software module, and the design of missile attitude control system simulation experiment. This design method can be used for missile attitude control system analysis, design and effectively assisting the designer to design the control system, simulation, optimization and programming, the linear system and nonlinear system by computer simulation, through adjustment of controller parameters to obtain satisfactory control effect online. It has a certain practical reference value for the actual design work.

SuA1-d-5

MDA-based Meta-Modeling Technique for Collaborative Simulation

Cheng Ma , 1 and Tianyuan Xiao1
1 The National CIMS ERC, Department of Automation, Tsinghua University, China

Abstract. Heterogeneity among multi-disciplinary models of complex products models hinders the sharing of information between subsystems, decreases the efficiency of collaborative development and becomes the bottle-neck of system integration and collaborative simulation. This paper analyses the current progress on model consistency description in collaborative simulation system for complex product development, and presents an UML Profile-based meta-model, CSMM (Collaborative Simulation Meta Model), referring MDA standard, to fulfill the consistency description of collaborative simulation model and collaborative behavior information. Also, the process for building collaborative simulation models of complex products based on CSMM meta-model is given. A case study has verified that this meta-model is able to support multi-granularity modeling and multi-resolution simulation in complex product development process.

SuA1-d-6

Research and Application on Simulation Technology of Natural Environment

Jing Li[1], Shaoning Zhang[1], and Jingyan Han[1]

1Beijing Electromechanical Engineering Institute, China

Abstract. The natural environment affects and restricts the performance of high tech vehicle and platform. Research shows that modeling and simulation technology of natural environment influence on the design, development and application of modern vehicle all round. The environmental effect on vehicle is analyzed, and the research scheme and the key technology breakthrough in the process of study are introduced. The simulation result indicates that this kind of research method has advanced in technology.

SuA1-d-7

Research on Multi-spectral Infrared Translation Technique Based on Fiber Array Plane

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Abstract. To satisfy the infrared detector simulation need for different wave bands, the research on multi-spectral infrared translation technique based on “fiber array plane”, was developed. It achieved that multi-spectral infrared scene simulator’s manufacturing, and the system contains video to visible transducer, visible to infrared transducer and multi-spectral optical system.

SuA1-d-8

A Compact Difference Scheme for Time Fraction Diffusion Equation with Neumann Boundary Conditions

Jianfei Huanga, Yifa Tanga, Wenjia Wangb, and Jiye Yang

LSEC, ICMSEC, Academy of Mathematics and Systems Science, Chinese Academy of Sciences, Beijing China Yuanpei College, Peking University, China

Abstract. This paper is devoted to the numerical treatment of time fractional diffusion equation with Neumann boundary conditions. A compact difference scheme is derived for solving this problem, by combining the classic finite difference method for Caputo derivative in time, the second order central difference method in space and the compact difference treatment for Neumann boundary conditions. The solvability, stabilityand convergence of this scheme are rigorously discussed. We prove that the convergence order of this proposed scheme is $O(T^{2-a} + h^2)$, where , and h are the time step size, the index of fractional derivative and space step size respectively. Numerical experiments are carried out to demonstrate the theoretical analysis.

SuA1-d-9

Particle-based Volume Rendering of Remote Volume Datasets Using FlowVR

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Abstract. In this paper, we present two different FlowVR systems aiming to render remote data using a Particle-based Volume Renderer (PBVR). The huge size of irregular volume datasets has always been one of the major obstacles in the field of scientific visualization. We developed an application with the software FlowVR, using its functionalities of “modules” which can be mapped and executed on remote computers, and communicating via ssh connections. Using a “Pixels Read-back and Send” and a “Particles Send” algorithms, we succeeded in creating an application designed for developing visualization programs with remote data particle-based rendering.

SuA1-d-10

Biogeography-Based Optimization for Identifying Promising Compounds in Chemical Process

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Abstract: Identifying promising compounds from a vast collection of potential compounds is an important and yet challenging problem in chemical engineering. An efficient solution to this problem will help to reduce the expenditure at the early states of chemical process. In an attempt to solve this problem, the industry is looking for predictive tools that would be useful in testing optimal properties of a candidate compound earlier. This paper explores the application of biogeography-based optimization (BBO) to attain such predictive work. BBO is a new evolutionary algorithm that is based on the science of biogeography. BBO is a population-based search method that achieves information sharing by species migration. The performance of the proposed BBO is compared with the performance of the same problems using genetic algorithm (GA) and particle swarm optimization (PSO). Simulation results show that BBO is a competitive method in determining an optimal solution to the optimization of promising compounds.

SuA2-a
13:30-15:30
Room3
Topic: Networked Modeling and Simulation Technology-1

SuA2-a-1

Network Synchronization Mechanism Design

Based on MMORPG

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Abstract. Based on the reason of network synchronization and the existing synchronization mechanisms, this article adopts the idea of message partition, IOCP and the thread pool technology, improves Time Warp algorithm and Dead Reckoning Algorithm, designs a integrated solution of synchronization between server and client to mitigate the synchronization problems in MMORPG. In the experiment, we compare and analysis the effect of traditional synchronous solutions and the effect of our solution, it is shown that this system can better solve the synchronization problem in MMORPG.

SuA2-a-2

Research of Networked Control System Based on Predictive Functional Control

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1School of Electric Power and Automation Engineering, Shanghai University of Electric Power, China
2School of Information Science and Engineering, East China University of Science and Technology, Shanghai , China

Abstract. As a hotspot in the field of the control theory research and control engineering application, networked control system (NCS) has drawn the domestic and foreign researchers' attention. The essence of NCS is that all kinds of information such as reference input, control input, object output etc can exchange data by the different components of networked control system, such as sensors, controllers and actuators and so on. As a model based advanced control technology, predictive functional control has the same advantages as model predictive control, its algorithm and principle are simple and can be easily realized. Takes the first-order plus time-delay system in typical industry process control system for example, the networked control system based on predictive functional control is designed in this paper, and the simulation platform by using TrueTime toolbox based on Matlab platform is constructed. The simulation result has shown that the control scheme is effective and feasible, and it can be used in engineering application.

SuA2-a-3

A Wireless Sensor Network Location Algorithm Based on Firefly Algorithm

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Ministry of Education, East China University of Science and Technology, Shanghai, China
2 .School of Electrical and Electronic Engineering, Shanghai Institute of Technology,Shanghai, China

Abstract. Wireless sensor network(WSN) is getting more attention from the society for its underlying application value. The position of the nodes is very important in some pictures. This paper proposes a new method of localization of target nodes based on the Firefly Algorithm(FA).We introduce the Firefly Algorithm and improve it . We discuss performance of our method based on the numerical simulations compared with other localization algorithm.

SuA2-a-4

Simulation Research on DSDV and AODV Protocol in Tactical Unit Network

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1Department of Equipment Command and Administration, AAFE,Beijing, China

Abstract. Ad Hoc Network and its potential application were introduced, typical proactive routing protocol DSDV and typical on-demand routing protocol AODV were analyzed and compared. Modeling and simulation for DSDV protocol and AODV protocol in tactical unit network were projected under VRNET Developer platform. Results show that DSDV protocol has pretty performance in network environment with fewer nodes, low mobility and high real-time requirements, and AODV protocol is more fit for network environment with many nodes and high mobility.

SuA2-a-5

The Transmission Power Control Method for Wireless Sensor Networks Based on LQI and RSSI

Shang Jin1, Jingqi Fu2, and Liming Xu3
1School of Mechatronic Engineering and Automation, Shanghai University,China

Abstract. Improving energy efficiency to prolong the lifetime is a key research issue of the wireless sensor networks. Appropriately adjusting the nodes transmission power is very important to reduce the network energy consumption. This paper proposes a transmission power control method based on LQI and RSSI which can dynamically adjust the network energy consumption and improve the energy efficiency of the wireless sensor nodes. The test conducted on a wireless network established in the lab shows that the transmission power control method can save the nodes energy effectively as well as significantly prolong the lifetime of the network.

SuA2-a-6

Research on ZigBee Wireless Meter Reading System in Opnet Simulator

Yinfang Wang[1] and Shiwei Ma[1]
1School of Mechatronics Engineering & Automation, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China

Abstract. The paper aims to evaluate the performance of a ZigBee wireless meter reading system using Opnet. At first, a scheme of distributed meter reading system is proposed. In order to simulate the real system, an energy

module special for CC2530 is added in Opnet. Then the necessary parameter configurations for it are considered. At last, the simulation environment of the proposed system is set up. According to the monitored global and local statistics, it comes to the conclusion that the scheme has the distinguishing characteristics of the smaller end-to-end delay, the few packet loss as well as lower energy consumption and can be well applied in the factual meter reading system.

SuA2-a-7

Network-in-the-loop Simulation Platform for Control System

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Abstract. In order to research how the real network influences the control system, a Network-in-the-loop simulation platform is established in this paper. The platform consists of two simulation modules and two communication interfaces. Plant modeling and controller design is based on Matlab whereas communication interfaces programming is complemented in Visual C++. In this scheme, data is exchanged between Matlab and VC++ by Dynamic Data Exchange (DDE) technology, while Windows Socket is used for networked transmission design. On the platform, users can design and imitate the real networked control online. Besides, the real-time delay data is obtained in Simulink environment. Finally, according to the simulation experiment of DC motor servo system, the validity of the simulation platform is demonstrated.

SuA2-a-8

Simulation on Fluid-Structure Interactions of Slots-Parachute Inflation by ALE Method

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Abstract：The dynamics of Parachute inflation involve a complex interaction between the canopy structure and the surrounding flow field. This article proposes a numerical study on the inflation of some life parachute (flat round slots). Combing with the CFD/CSD and FEM techniques, the computational mechanic models as well as the simulation models of slots-parachute and fluid domain were built; utilizing the arbitrary Lagrangian Euler coupling method within highly nonlinear finite element code LS-DYNA , the simulation of 3D fluid-structure interaction (FSI) results of parachute was addressed. The visualization of slots-canopy deformation, canopy projected area and inflation forces were obtained. Specifically, the evolvement of vortex in fluid field was investigated to understand the mechanism of slots-parachute inflation. The results validated the validity and veracity of ALE coupling method for the simulation of slots-parachute inflation, and this technique will be further used in airdrop test.

SuA2-b
15:50-18:10
Room3
Topic: Networked Modeling and Simulation Technology-2

SuA2-b-1

Stochastic Stability Analysis of MIMO Networked Control Systems with Multi-Quantizers

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1Shanghai Key Laboratory of Power Station Automation Technology, School of Mechanical Engineering & Automation, Shanghai University,China

Abstract. This paper is concerned with stochastic stability analysis of MIMO NCSs with multi-channel communication constrain and multi-quantizers. With communication constrains treated as packet disordering and quantization error treated as sector-bounded uncertainty, the closed-loop system is firstly modeled as a Markov jump linear system (MJLS). A stochastically stable condition has then been derived, and the main results are further extended to MIMO NCSs with parameter uncertainty. Finally, simulation results confirm the effectiveness of the proposed method.

SuA2-b-2

Remote Iterative Learning Control System with Duplex Kalman Filtering

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2School of Information and Electronic Engineering, Ludong University, China

3School of Information and Electronic Engineering, Anhui Polytechnic University, China

Abstract. This article investigates the iterative learning control (ILC) problem for a remote network control systems under wireless network condition. To reduce wireless channel noise, a novel method of duplex Kalman filtering is firstly presented and combined into the remote ILC system. The convergence of system is analyzed and the convergence condition is given. The merit of the propose method is also verified by comparing the fluctuations boundaries of the two cases with Kalman filtering and without Kalman filtering. Finally, simulation results confirm that the tracking accuracy is greatly improved in comparison with other approaches under different cases of ILC and Kalman filtering.

SuA2-b-3

Prognostics for Aircraft Control Surface Damage Based on Fuzzy Least Squares Support Vector Regression (FLS-SVR)

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1Science and Technology on Aircraft Control Laboratory,Beihang University, China

Abstract. The trends of flight control system state parameters which can be measured are indirect manifestations of surface damage. In order to predict the changes of states trend more accurately, an algorithm based on fuzzy least squares support vector regression (FLS-SVR) was presented. This approach reconstructed the phase space of multivariate time series using K-L transformation method. A FLS-SVR model was built with the new information priority theory according to apply a fuzzy membership to each input point. The SVR parameters were optimized by genetic algorithm (GA) to improve the accuracy of the model. In order to verify the validity of FLS-SVR algorithm, the prognostics and analysis of surface damage trend were performed. The simulation result demonstrates the prognostics model has good predictive ability.

SuA2-b-4

The SOS Simulation of Network-Centric Information System Based on Agent

Fang Zhou[1] and Shaojie Mao[1]

1The Information System Important Laboratory of the 28th Research Institute of China Electronics Technology Group Corporation, Nanjing, China

Abstract. In this paper, the concept, composition and architecture of network-centric information system are firstly introduced. Secondly, the methodology of Agent-based modeling (ABM) is used to establish the simulation model of command and control (C2) node of network-centric information system. At last, a method based on the information associated network is proposed to solving the problem of the System of System (SOS) simulation on network-centric information system. Through analyzing the information interactive relationship between information system nodes, the interactive contents are real-time computed and stored in a two-dimension table. So according to the information interactive relationship and interactive contents, the SOS running effect of network-centric information system can be high fidelity simulated.

SuA2-b-5

Modeling on 3D Atmospheric Transmission of Infrared Radiation

Zhifeng Li[1], Xu Geng[1], Fan Li[1], and Li Zhang[1]

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Abstract: On the basis of analysis atmosphere, a new method of calculating the atmosphere transmissibility is introduced. The 3D model of atmospheric transmission of infrared radiation is established for calculating atmospheric transmittance, thermal emission, and single scatter solar radiance along sensor-to-target lines-of-sight (LOS) within a three-dimensionally varying atmosphere. This model analysis the various factors which affect the infrared radiation of atmospheric transmission. The calculation results of atmosphere transmissibility not only consider the atmosphere layering situation along the vertical direction but also atmosphere molecules distribution variable along the horizontal direction. Finally, the simulation images show in this paper.

SuA2-b-6

Link Prediction Based on Weighted Networks

Zeyao Yang[1] , Damou Fu[1], Yutian Tang[1], Yongbo Zhang[1], Yunsheng Hao[1], Chen Gui[1], Xu Ji[1] , and Xin Yue[1],

1 College of Computer Science and Technology, Jilin University, China

Abstract. Link Prediction can make networks more complete. However, because of restraint of algorithm, traditional link-prediction measures cannot make full use of weight information to analyze the network. To solve this problem, this paper proposes a new method based on weighted networks, and the new method synthesizes and improves existent methods so that the predictor could make use of weight information in the network. We apply the new method to three real networks (astro-ph, cond-mat and hep-th). The result of experiment demonstrates that new method is more precise, and this method provides people with a new idea about how to better analyze weighted networks

SuA2-b-7

Research on Product Comprehensive Information Modeling

Xinghui Dong[1], Yuwei Zhao[1], Ying Liu[1], and Yuanyuan Li [1]

[1]School of Energy, Power and Mechanical Engineering, North China Electric Power University, China

Abstract. To meet the demand of information model ,this article analyzed the evolution for information model, presented and clarified the concept, ideas and content derived from product comprehensive information model; through the detailed and concise classification to the information of lifecycle, drew the composition structure of product comprehensive information model, and built product comprehensive information model from both overall and local aspects; at the same time, provided the expression form for product comprehensive information model and the document type to access its information as well.

SuA2-b-8

Research on Structure of Communication Network in Smart Grid

Feng Ran[1], Hailang Huang[2], Tao Wang[2], and Meihua Xu[2]

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2.School of Mechatronics Engineering and Automation Shanghai University, China

Abstract. As the next generation of power systems, smart grid is a high degree integration of electric power, communication and automatic control. A safe, effective and intelligence communication platform is the precondition of building Smart grid. This paper introduces an

overview of power communication in nowadays, analyzes and probes the structure and safe strategy of communication network in Smart grid. Several key technologies of communication safety in Smart grid are summarized and generalized. This paper has important reference value to the research area of the communication safety of Smart grid.

SuA2-b-9

Analysis of Information Encryption on Electric Communication Network

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1.Research and Development Center of Microelectronics Shanghai University , China
2.School of Mechatronics Engineering and Automation Shanghai University, China

Abstract. The greatly improvement of electric power automation is making electric power system increasingly depend on the information networks to ensure its safety, reliable and efficient operation. This paper introduces the general situation of electric power system and power information network system in nowadays. Finally, two typical encryption algorithms DES and RSA are analyzed and compared, and software program based on QT is used to prove the principle of the encryption algorithms. This paper also has some reference value for the research on security of electric power telecommunication.

SuA2-b-10

Real Time Reconstruction of Fluid in Video 6

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Abstract. To meet the needs of real time modeling fluid natural landscape in augmented reality application, this paper puts forward a new method of real time reconstruction of fluid in natural landscape. This method takes the combination measure of image analysis and LBM (Lattice Boltzmann methods). We first use the optical flow calculating method of LK(Lucas-Kanade) to obtain the dense result, and then take LBM to calculate the joint force of central particles further. At last we use LBM to calculate the height of every particle based on the joint force. In the study, in order to improve the real time characteristics of reconstruction, we use the height calculating method based on optical flow and LBM to reconstruct the fluid alternately. Further experiments have shown that the method is a valid fluid reconstruction method of real time and can be used in the study of natural landscape fluid with efficiency and feasibility.

SuA3
13:30-15:30
Room4
Topic: Modeling and Simulation Technology on Synthesized Environment and Virtual Reality Environment

SuA3-1

A Fast Intuitionistic Fuzzy Support Vector Machine Algorithm and Its Application in Wind Turbine Gearboxes Fault Diagnosis

Bin Jiao[1] and Qing Zhang[2]
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2East China University of Science and Technology, Shanghai, China

Abstract. Support vector machine has been successfully applied to the fault diagnosis field, but there are still some problems in practical applications. In this paper we proposed an improved algorithm which reduces the number of support vectors through the reduction of the sample spae to improve the efficiency of the algorithm. As the traditional fuzzy support vector machine cannot classify the sample with the same membership, so we use intuition index to lower the probability of the sample to get the same membership. Here we improve the accuracy of the algorithm through properly redefine the fuzzy membership and intuition index. Finally, we use the improved algorithm to build a multi-classifier based on one against one principle and the voting rules, and apply the multi-classification algorithm to the wind turbine gearbox fault diagnosis. The diagnose results prove that the improved algorithm we proposed can properly resolve the problem of wind turbine gearboxes fault diagnosis.

SuA3-2

The Induced Charge Test under Thunderclouds Simulation Background

Xiaoming Ren[1], Jun Liu[1], and Qin Zhou[1]
1School of Electric, Shanghai Dianji University, China

Abstract. In order to study induced charge under simulated thunderclouds background, a thunderclouds simulation test platform had been built and a measuring instrument of induced charge had been developed. The test platform consisted of a metal disk, whose diameter is 3 meters the change of electric field can be simulated though imposing changing voltage to the metal disk. The slow changing electric field can be simulated by applying the direct-current voltage to the disk and cut it off instantaneously, while the fast changing electric field can be simulated by applying the impulse voltage to the disk. The induced charge can be measured by the measuring instrument under these two methods. The results showed that measuring instrument of induced charge can realize measurement of simulated fast changing and slow changing electric field. So the measuring instrument can be applied to the study of induced charge.

SuA3-3

Real-Time Visualization for Large Scale Terrain Based on Linear Quadtree

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1 State Key Laboratory of Virtual Reality

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2 Large Aircraft Advanced Training Center, Beihang University, China
3 School of Automation Science and Electrical Engineering, Beihang University, China
Abstract. To solve the problem of low frame rate and high memory space cost in large scale terrain visualization, a real-time rendering algorithm based on linear quadtree is proposed in this paper. It consists of three parts. Firstly, digital elevation models (DEMs) are de-sampled to get the same size blocks, terrain pyramid model is built with different scales and biases factors offline. Then linear quadtree index of terrain blocks is created for fast query, a more reasonable scheduling scheme is defined, and every frame only allowed loading one terrain block in order to avoid unstable rendering quality. Finally, GPU-based morphing method is applied to slow down vertex popping; vertical skirt is used to eliminate crack. Compared with Geomipmapping algorithm, the experimental results show the proposed algorithm could drop down memory space, GPU processing time and GPU rendering batches significantly, and the rendering rate is high and smooth.

SuA3-4

Research on Modeling and Application of Synthetic Natural Environment

Zhenhua Lv 1 and Guanghong Gong 1
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Abstract. Traditional simulation application was normally carried out with restricted consideration of environmental factors. Through comprehensive and systematic analysis of natural environment, a novel integrated environment representation method was proposed and applied to a vehicle-mounted platform simulation application system with synthesized concerns of natural factors. The comprehensive simulation experiments with diversity of natural environment elements were integrated in traditional system employing the mathematical models and the 3D rendering engine techniques to reflect the relatively close-to-nature effects of the simulation system. The simulation results are proved to be competent and offered an applicable solution for evaluating the simulation system.

SuA3-5

Symbolic Representation of Vector Map in Virtual Geographic Environment

Xuefeng Cao1 and Gang Wan1,
1 Institute of Surveying and Mapping, Information Engineering University, China

Abstract. Those basic geometric graphs such as lines and polygons are the main representations used by 3D rendering methods of vector map at present. It is so simple that strictly limited map feature information has been transferred. Consequently, an extended rendering method based on the shadow volume stencil theory is presented, which allows real time symbolical overlay of vector map on terrain. Firstly, the basis of vector data visualization based on stencil shadow volume theory has been reviewed. Secondly, in order to improve visualization effect, the cartographic symbolization of vector map, i.e. roads, has been dedicated, which includes smooth border with rounded caps, outlines and overlaps. Finally, the experiment shows that real time displaying of vector map on terrain has been achieved, and the visualization effects have been improved by cartographic symbolical overlay.

SuA3-6

Modeling and Simulation of Nearshore Waves

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2. National Key Laboratory of Underwater Information Process and Control, Xi'an, China

Abstract. This paper presents a new modeling method for simulating nearshore waves. Waves in the process of moving to the nearshore are more complex than to the deep-sea. Nearshore wave modeling in addition to the need to consider gravity and wind effect, but also consider the impact of the seafloor topography. We construct the mathematical model of the seafloor topography. Then, the waveform data generate while constructing the seafloor topography data. Finally, we achieve real-time simulation of nearshore waves based on parametric surfaces. This experiment proved that this method can quickly realize simulation into the nearshore waves.

SuA3-7

3D CG Model and Virtual Space of Court Noble House "Reizei-ke"

Wang Sheng1, Susumu Nakata2 , and Satoshi Tanaka2,
1 Graduate School of Science and Engineering, Ritsumeikan University, Japan
2 College of Information Science and Engineering, Ritsumeikan University, Japan

Abstract. The residence of "Reizei-ke" (Reizei family) is the only existing court noble house in Japan. This paper presents a high quality 3D CG model of Reizei-ke, and a virtual space built by a 3D game engine. Users are able to enjoy a cosmic voyage which demonstrates a scene of ancient Court nobles of Japan.

SuA3-8

A Novel Optimization Approach—Free Search with Double Populations 7

Yuefei WEI1, Zengqiang CHEN1, Yibo LI2, Qinglin SUN1

1 Department of Automation, Nankai University, Tianjin, China
2 Department of Communication Engineering, Beijing Institute of Technology, Beijing, China.

Abstract: In this paper, an improved optimization approach, free search with double populations (FSDP) which is based on free search (FS) algorithm, is proposed. Comparing to FS

algorithm, FSDP preserves the sub-optimal solutions and adopts elitism strategy in the searching process, which effectively avoids falling into local optimum and improves the convergence speed and the searching accuracy. Simulation results show that FSDP has a better comprehensive performance over FS, PSO and GA.

SuA4
15:50-18:10
Room4
Topic: Modeling and Simulation Technology of Continuous System, Discrete System, Hybrid System, and Intelligent System

SuA4-1
Research on Description Method of Operational Task Oriented Operational Effectiveness Evaluation
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1Department of Equipment Command and Management,The Academy of Armored Forces Engineering
Beijing, China
Abstract. Equipment of weapon is a critical factor which determines the result of information-age warfare. Operational effectiveness evaluation is an important step in equipment of weapon development and construction. In order to demonstrate the development scheme of equipment and weapon correctively and effectively, the measures of effectiveness need to be selected scientifically. Operational task is the standard factor of operational effectiveness. The concept of different types of effectiveness is given and analyzed firstly. The requirement of description of operational task is also analyzed at the same time. Then the measures of effectiveness hierarchy are put forward. Aiming to the concept and characteristic of operational effectiveness, a formalized description method is discussed. The description products of operational task are defined and specialized. Then the detailed description process is given. This is of some importance and realistic and theoretic meaning to make sure that the development of weapon and equipment is scientific and reasonable.

SuA4-2
Modeling and Simulation Methodology of Multifield Coupling for Hypersonic Vehicle
Ping Ma[1], Tao Chao, and Ming Yang
1Control and Simulation Center, Harbin Institute of Technology,China
Abstract. Multifield coupling among gas flow, heat transfer, structure deformation and flight control is an important phenomenon for hypersonic vehicle. The coupling mechanism can be simplified according to simulation purpose. Typical simulation tests for different phases of hypersonic vehicle guidance, navigation and control (GNC) system design process are presented and the coupling boundaries are also given. Multifield coupling simulation time advancement scheme is proposed and calculation method for each field is presented. Multifield coupling simulation platform design method methodology is presented and an integrated numerical simulation platform prototype, consisting of geometry configuration design, mesh grid generation, trajectory optimization, GNC, aero-thermo-elastic coupling calculation, simulation results visualization and analysis software is designed. The functions of CSC-MPCSim are demonstrated through modeling and simulation of a flight vehicle with a configuration similar to X-43 hypersonic flight vehicle designed by NASA of the USA.

SuA4-3
Research on Target Electro-optical Tracking Based Fuzzy Disturbance Observer Controller
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[1]Beijing Changan Auto Engineering Research Co.Ltd, Beijing, China
[2]School of Automation Science & Electrical Engineering, Beihang University, China
Abstract. The compound axis control technique is a quick and effective approach to improve the accuracy of high precision target tracking systems. However, traditional disturbance observer controller can not inhibit all-domain noises and can not achieve ideal performance. The robust control method based on fuzzy disturbance observer(FDO) is introduced in this paper, and the method is applied to the electro-optical tracking system together with the Kalman Filter. Compared to the traditional method, the method based on FDOB can inhibit high-frequency noise and compensate low-frequency interference better finally.

SuA4-4
Comparison on H∞ Filter and Kalman Filter for Initial Alignment of SINS on Static Base
Bo Yang[1]and Xiuyun Meng[1]
1Beijing Institute of Technology, China
Abstract. This paper discusses two kinds of initial alignment for Strap-down Inertial Navigation System(SINS), one is based on Kalman filter, and the other is based on H∞ filter. Through modeling, simulating and comparing, it can be concluded that using the former, with given system model and the noise characteristics, the leveling misalignment angles converge relatively rapid, but the azimuth misalignment angle converges relatively slow. If there is too large disturbance on system model, Kalman filter would be prolonged, even be emanated. However, the standard Kalman filter performances can be improved by using H∞ filter. The latter performs better than the former in azimuth alignment and equivalent to the former in level alignment. And H∞ filter can also greatly enhances the robustness of the system.

So H∞ filter is an available method for the initial alignment.

SuA4-5

Self-generating Interpretable Fuzzy Rules Model from Examples

Meng Li[1], Zhiwei Hu[1], Jiahong Liang [1], and Shilei Li[2]

1College of Mechanical Engineering and Automation, National University of Defence technology, China

2Department of Information Security, College of Electronic Engineering, Naval University of Engineering, China

Abstract. In this paper, we propose a powerful method for automatically generating interpretable fuzzy rules model from a set of given training examples (i.e. numerical data) which are sampled from an unknown function. Self-generating fuzzy rules from examples can be used as a common method for simulation such as behavior simulation for virtual humans and CGF. Our method consists of two steps: Step 1 automatically extracts a fuzzy rule base which can approximate the unknown function with an approving accuracy by introducing a homologous Gaussian-shaped membership function. Step 2 improves its interpretability by deriving linguistic rules from fuzzy if-then rules with consequent real numbers. In this way, we achieve the balance between the accuracy and interpretability of the generated rules. Finally, we show the availability of our method by applying it to the problem of function approximation.

SuA4-6

Modeling and Simulation on Pulse Compression of Hybrid-modulation Signal Based on Simulink

Biao Wu[1], Kaining Xiao[1], Guoqin Shen[1], Ning Zhou[1], and Zhaohui Han[1]

1Electronic System Engineering Company of China, China

Abstract. The principle of the hybrid-modulation signal and the method of its pulse compression are introduced, and then the simulation model of pulse compression is established by Simulink. Some difficult problems and their solutions in the process of simulation are analyzed here, and the results of simulation are given. According to the analysis, it is known that the simulation realizes the pulse compression of the hybrid-modulation signal, and it can offer reference not only for the modeling and simulation of radar system, but also for the research of the radar signal digital processing technology.

SuA4-7

The Reentry Trajectory Optimization for Lifting Vehicle by Using Gauss Pseudospectral Method

Yuxing Yang[1] and Xiuyun Meng[1]

School of Aerospace Engineering, Beijing Institute of Technology,China

Abstract. To obtain the flight trajectory for lifting vehicle after reentry atmosphere, the Gauss pseudospectral method is used to convert the reentry trajectory optimization problem of three-dimension for the vehicle into a nonlinear programming problem. The path constraints include the heat flux peak on stagnation point and maximum dynamic pressure and the terminal constraints include the vehicle's height and position, and the optimal performance index is the minimum total heat absorption. The angle of attack and bank angle are chosen as control variables. The result of simulation indicates that the GPM is effective to solve trajectory optimization problem, and can satisfy the above optimization index and constraint condition.

SuA4-8

Intelligent Remote Wireless Streetlight Monitoring System Based on GPRS

Meihua Xu[1], Mengwei Sun[2], Guoqin Wang[1], and Shuping Huang[2]

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Abstract. According to the development trend of the streetlight, this paper presents a remote and wireless streetlight monitoring system based on GPRS. GPRS stands for General Packet Radio Service, it has a lot of advantages like widely used, high transmission speed, low power consumption and so on. The system uses microcontroller chip MSP430F2274 and wireless transceiver chip CC2500. The whole network consists of the control center and up to 100 groups of control network, and each control network has up to 100 terminal nodes, terminal nodes measure humidity, current, voltage and other information, and send these information to the transition points by the RF wireless transceiver module, then the transition points transmit information to the control center through GSM/GPRS networks. The control center will deal with the data so that it can know the situation of each streetlight. According to the result the control center gives orders to each streetlight to control the switch state and illumination of them.

SuA4-9

Research of Time-delay Chaotic Systems via Linear Feedback

Hua Wang[1], Xin Wang[1], Xianhai Shen[1], and Xuliang Zhang[1]

1School of Mechatronics Engineering and Automation,Shanghai Key Laboratory of Power Station Automation Technology,Shanghai University, China

Abstract. Based on the Razumikhin theorem of time-delay systems, this paper discusses chaos control and synchronization of chaotic systems with time-varying lags. A novel method for time-delay chaotic systems is derived. Linear and feasible controller is designed to control and synchronize Lorenz system with time-varying lags.

The proposed controller can realize chaos control even though there exist unknown time-varying lags. This method can be applied to a class of systems with different time-varying delays too. Numerical simulation results are given to show the effectiveness of the proposed method.

SuA4-10

Simulation and Design on Resonator of novel-structure Solid-state Vibratory Gyroscope

Xiaofei Ma, Zhong Su , Xu Zhao , Shaoxin Tian
(Institute of Intelligence Control, University of Beijing Information Science & Technology, Beijing, 100101, China)

Abstract: Resonator is the core component of Solid-state Vibratory Gyroscope (SVG), its structure and vibration characteristics directly determine the gyro performance. A paraboloid of revolution shaped resonator (PRSR) with high overload resistance characteristics was proposed and designed. The model is established by FEM, its natural frequency and vibration modes were analyzed, and effects of structure parameters on natural frequency were obtained. On this basis, the optimized structural design parameter was given and applied to actual machining. Experiment on actual resonator proved that this method is reasonably practicable.

SuA5
13:30-15:30
Room5
Topic: Modeling and Simulation Technology of Complex System and Open, Complex, Huge System

SuA5-1

Towards A Course of Action Probability Ontology for Logistic Supply Destruction Operation

Xinye Zhao[1], Zhongchen Fan[1], Shanliang Yang[1], and Kedi Huang[1]
1Mechatronics & Automation school, National University of Defense Technology, China

Abstract. Military planning has been an increasingly complex activity that involves identifying the enemy and friendly multiple operation strategies to find effective COA determination to achieve desired effects. To address this issue, our work relies on probabilistic ontology which extends ontology to capture uncertainty in a principled and standardized way. Probabilistic OWL (PR-OWL) is an OWL upper ontology for representing probabilistic ontology. The design of the COA-Ontology strives to support course of action (COA) planning on the upper level of PR-OWL ontology classes. While the user-defined domain-specific classes that convey the equivalent of what a standard ontology is constructed beyond the COA ontology. This paper has proposed the preliminary design of a case of the logistic supply destruction operation (LSDO) for using probabilistic ontology to find effective courses of action.

SuA5-2

Research on System of Systems Complexity and Decision Making 10

Yingchao Zhang[1], Xiao Sun[1], Lili Chen[1], Jing Zhang[1], and Yi Liang[1]
1Beijing Institute of System Engineering,Science and Technology on Complex Systems Simulation Laboratory,Beijing, China

Abstract. Complexity in System of Systems (SoS) is a key factor in SoS decision making. This paper analyzes the main characteristics of SoS, especially its complexity in terms of monolithic emergence, component systems adaption and uncertainty in SoS evolution. It further discusses the effects of SoS complexity on SoS decision making. In light of SoS complexity, the paper figures out the major problems that need to be addressed in four areas, namely SoS adaption, abnormity analysis in SoS evolution, exploratory analysis of SoS capability and SoS simulation. In conclusion the paper proposes a preliminary SoS decision making model based on the analysis of SoS adaption.

SuA5-3

Degree Dependence Entropy: A New Descriptor for Complex Networks

Xiangli Xu[1] and Xiaofeng Hu[1]
1The Department of Information Operation and Command Training,NDU of PLA, Beijing China

Abstract. In order to supply better accordance for modeling and simulation of complex networks, a new degree dependence entropy (DDE) descriptor is proposed to describe the degree dependence relationship and corresponding characteristic in this paper. First of all, degrees of vertices and the shortest path lengths between all pairs of vertices are computed; then the degree dependence matrices under different shortest path lengths are constructed; and the DDEs are extracted from the degree dependence matrices at last. Simulation results show that the DDE descriptor can reflect the complexity of degree dependence relationship in complex networks, high DDE indicates complex degree dependence relationship, low DDE indicates the opposite one, and the DDE can be seen as a quantitative statistical characteristic, which is meaningful for networked modeling and simulation.

SuA5-4

Runtime Reconstruction of Simulation Models for Dynamic Structure Systems

Fa Zhang 1 and Qiaoxia Zhao 2
1School of Management, Air Force Engineering University, China;
2School of Information&Navigation, Air Force Engineering University, China

Abstract. In many simulation applications, the target system may change its structure unpredictably. The simulation model should adjust in time, to follow the evolving of the target

system. In this paper we put forward a new definition of system to accommodate the dynamic structural change, and classify the structural change of system, include change in components, relationships among components and interaction between system and its environment. Then we propose a distributed framework of simulation model, which supports runtime reconstruction. In this framework, connector components work together to integrate and manage computing components. These elements and their relationship are discussed using π-calculus. We study the weak bi-simulation condition in component replacing, and discuss the consistency of transition of system states. Finally, we point out main problems in modeling and simulation for dynamic structural systems.

SuA5-5

A Data-based Fuzzy Cognitive Map Mining Method Using DE-SQP Algorithm

Wenhui Shou1, Wenhui Fan1, and Boyuan Liu1
1 Department of Automation, Tsinghua University, Beijing China

Abstract. Fuzzy Cognitive Map (FCM), which was first proposed by Kosko in 1986, is a novel tool for knowledge description and management. In this paper, we propose a new approach to mine the FCMs on the basis of data resource. First, raw data stored in the databases is preprocessed and converted to a fixed interval. Then, we adopt a novel hybrid optimization algorithm DE-SQP to produce the optimal weight matrix, whose goal is to make the weights fit the historical data best. At last, we apply the proposed method to solve a real-world problem. The experimental results show that the method is effective and efficient to mine the casual relationships hidden in the data resources by using the hybrid algorithm DE-SQP and the construction of FCMs gets rid of the intervention of domain experts, which guarantees the objectivity and completeness of the FCMs.

SuA5-6

Study on Modeling and Simulation of Agent-based Agricultural Economic System

Yongtao Zhang1, Kedi Huang[1], and Ge Li[1]
1 School of Mecatronics and Automation, National University of Defense Technology, Changsha, China

Abstract. In this paper, we build an agent-based model named AAEM to research agricultural economy. By contrast with traditional macroeconomic models, the agent-based model emphasizes understanding the forming courses of various macroeconomic phenomena at the microeconomic level, so it can deal much better with unknown economic phenomena and policies. After introducing the mechanics of AAEM, we establish peasant household agents as the main body of AAEM and define several other common types of agents for AAEM. On the basis of theoretical study, we focus on designing each type of agents' actions. In particular, self-adaptive learning algorithm is used to implement agents' decision making. Furthermore, we test AAEM through a simulation instance where the government increases the purchase of rice to encourage rice production. All agents in AAEM adapt well to the policy change, which demonstrates that AAEM has great potential to improve agricultural economic policy analysis and to provide new insights into underlying agricultural economic principles.

SuA5-7

Methods to Improve Accuracy and Speed for the Quasi-3D Electromagnetic Environment Simulation

Yuewei Shen1, Lin Zhang1, Yingnian Wu1,2, Lan Mu1, and Yandong Lv1
1 School of Automation Science and Electrical Engineering, Beihang University,China
2 School of Automation, Beijing Information Science & Technology University,China

Abstract. The parabolic equation (PE) method is very effective for computing the complex electromagnetic environment (EME) simulation. For the large-scale 3D EME simulation based on the PE method, the computation and time complexity is not acceptable. To solve this problem, a quasi-3D PE simulation method with low complexity is introduced. But the accuracy of this method is not high, and some methods have been proposed to improve the accuracy by compensating error, choosing appropriate slice angle, interpolating some values between slices and mixing the PE and ray tracing method. With a multi-level parallel method, the 3D EME simulation can be paralleled from the three levels: job parallel, task parallel, thread parallel, and it is used to accelerate the computation process dramatically in order to calculate faster.

SuA5-8

A Novel Simulation Method of Production Line Based on System Dynamics

Yuan Feng and Wenhui Fan
1Department of Automation, Tsinghua University,Beijing 100084, P.R. China

Abstract. In an attempt to balance the production line in a car engine parts company, we build the simulation model based on system dynamics, which is rarely applied in the field of production line modeling. According to the data collected from simulation, we raise the proposal to balance the overall production line. Considering the result after deploying, the improvement can be described as significant. Besides, we explore further connections and relationship among some important parameters. The conclusion can give us instructions about how to keep the line working steadily and efficiently.

SuA6
15:50-18:10
Room5
Topic: Simulation Based Acquisition and Virtual Prototyping Engineering Technology

SuA6-1

Using Distance-based Outlier Detection Method to Handle the Abnormal Gateway in WSN

Wei Su [1], Jingqi Fu [1], and Haikuan Wang [1]

[1] Shanghai Key Laboratory of Power Station Automation Technology, School of Mechanical Engineering and Automation, Shanghai University, China

Abstract. The gateway of wireless sensor network (WSN) plays a key role in the network system. Its stability and reliability is very important to the WSN. The abnormal of gateway will make the network sequence disorder. The node can't report its data to the gateway, and it will need much more power consumption. In this paper, we propose a star topology network and the redundant node can monitor the node data and realize the gateway working status detection. We establish the relevant mathematical model based on the distance-based outlier detection method (DBODM) to analysis the gateway. When the deviation value is more than a certain threshold, the redundant node changes the nodes' working patterns through sending the intelligent decision message, to realize the node working in low power consumption.

SuA6-2

Security in Underwater Acoustic Sensor Network: Focus on Suitable Encryption Mechanisms

Ji Eon Kim[1], Nam Yeol Yun[1], Sardorbek Muminov[1],Soo Hyun Park [1,†] ,
and Ok Yeon Yi [2]

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[2]Dept. of Mathematics, Kookmin University, Korea

Abstract. Underwater acoustic sensor network (UWASN) technology is advancing recently, and research is increasing rapidly. UWASN can be applicable to many fields such as underwater monitoring, underwater resource exploration, ocean data collection, and military purposes. Existing terrestrial wireless sensor network security mechanisms have not been applied to UWASNs due to interference such as multipath propagation, signal fading, limited bandwidth, slow data rates, and long transmission delays. UWASNs also require security mechanisms and algorithms to maintain data confidentiality and integrity. Security-related research is being actively conducted, but it is still in its nascent stages. Therefore, when considering a UWASN protocol stack, the application layer, when sending data to its sub-layer, needs to encrypt the payload for information security. In this paper, we consider the requirements and security issues of UWASNs. We also discuss applicable security algorithms that are suitable for UWASN.

SuA6-3

Towards a Biological More Plausible Artificial Neural Networks

Junaidi Bidin[1] and Muhamad Kamal M Amin[1]

[1]Graduate School of Electronic System Engineering, Malaysia-Japan International Institute of Technology (MJIIT),University Technology Malaysia Kuala Lumpur Campus, Kuala Lumpur, Malaysia

Abstract. This paper presents a simulation of a biological more plausible neural network system. The system modeled a Spiking Neural Network for self-organized architecture. Recently, Spiking Neural Networks have been much considered in an attempt to achieve a more biologically realistic neural network which was coined as the third generation Artificial Neural Networks. Spiking neurons with delays to encode the information is suggested. Thus, each output node will produce a different timing which enables competitive learning. The suggested mechanism is designed and analyzed to perform self-organizing learning and preserve the inputs topology. The simulation results show that the model is feasible to perform a self-organized unsupervised learning. The mechanism is further assessed in real-world dataset for data clustering problem.

SuA6-4

OpenGL Simulation System for ICF Target-positioning

Xiaolei Li1, Wei Song1, Yanan Zhang1 and Xu Liu1

1School of Mechatronics Engineering and Automation, Shanghai University, China

Abstract: In ICF (Inertia confinement fusion) physical experiments, target-positioning accuracy is so important that directly affects the success rate of target hitting. This paper presents an ICF installation simulation system for target positioning by visual detection, which is conducted by "OpenGL" graphics software under "C++ Builder 6.0" programming environment. In order to realize the target pose measurement and obtain the target's 3D pose measurement value, it includes the pose detection algorithm and image processing algorithm. The experiment and data analysis result has confirmed that our system can successfully accomplish posture detection and target positioning.

SuA6-5

The Design of Shock Test System Based on C#

Xiaohua Wang[1], Wenzhong Luo[2], and Peng Zan

1school of Mechatronic and Automation, Shanghai University, China

Abstract. Mechanical shock tests are very important for many products when these products are subjected to high risks of impact loading. This paper introduces the software design of a shock table test based on C#. The software system receives the acceleration data from a lower computer, then processes the data and uses FFT and shock response spectrum (SRS) to judge shock test result. The mixed C# and matlab programming method makes SRS analysis easier to achieve.

SuA6-6

Simulation Research on Unit Element Calibration Method Based Geometry Discretization

Yulin Jiang [1] and Bin Li [1]

1College of Mechatronics Engineering and Automation, Shanghai University,China

Abstract. The unit element calibration method is simulation analyzed in this paper. First, the effective space of flow meter is divided by grid method, then the number of optimal nodes is determined through the successive approximation method, further the optimal measurement step length is gotten under fixed diameter. The experimental results show that the optimal measurement step length is very close to actual step length made by experiment.

SuA6-7

Research and Application on SBA Life-cycle Managemenrt Technology of Complex Products System

Tan Li1, Xudong Chai1, Baocun Hou1, Shuai Fan1, Wenhai Zhu1, Shan Feng3, Deyu Kong 2, Yuan Li2, and Weijing Wang1

1. Beijing Simulation Center, China;

2. Beijing University of Aeronautics and Astronautics, China;

3. Huazhong University of Science and Technology, China

Abstract. Based on the research fruits of paper [1], the author introduces some new technologies into SBA collaborative supporting environment, including network technology (Internet / Web Service / Grid Computing), Artificial Intelligence and XMSF technology. Firstly, the author states a new integrated and intelligent infrastructure of SBA collaborative supporting environment which can fulfill the features and demands mentioned above; then some solved key technologies are explained in detail according to the latest research; at the end, good conclusions are verified by elementary application, which are, (1) the pre-setup prototype of SBA collaborative supporting environment are featured by networktized, intelligent, collaborative and integrated, as well as its good openness, security, extensibility and general, which can support the multidisciplinary team to collaboratively carry out the virtual R&D of complex products. (2) Combined with SBA integrated modeling, Hall of Workshop of Metasynthetic Engineering, Life-cycle cost model and integration framework, the environment supports multi-location, multi-group, multi-disciplinary simulation applications, SOS (System of Systems) and qualitative-quantitative analysis, and is also supportive to the management, share and reuse of various simulation resources, which are very suitable for the SBA procedure of complex product.

SuA6-8

CANoe-based Modeling and Simulation for Heavy Lorry CAN Bus Network

Xinyan Li[1], Min Huang[1], Jie Zhan[1], Yongliang Ni[1], and Fengying Pang[1]

1China North Vehicle Research Institute, Beijing, China

Abstract. The modeling for heavy lorry CAN bus network with CANoe is provided, and software simulation, semi-physical simulation and system integrated test are realized based on the modeling. The performance index of system and the statistic information of bus load parameters are obtained by the simulation with various stages. The validity and feasibility of the CAN bus network design are verified, the development period is shortened, the development cost is reduced and the work efficiency is improved.

SuA6-9

Finite Difference Method for Solving the Time Fractional Diffusion Equation

Yu-xin Zhang[1], Hengfei Ding[1]

1School of Mathematics and Statistics, Tianshui Normal University,China

Abstract. Fractional diffusion equations are generalizations of classical diffusion equations, treating super-diffusive flow processes. In this paper, we develop a difference scheme based on Hermite formula for solving onedimensional time fractional diffusion equation. Stability and convergence results of the difference scheme are discussed. Finally, a numerical example is carried out to confirm the theoretical results.

SuA6-10

Some Focuses on Research of Land-based Simulation Test Technology for Shipborne Weapons

Chi He1, Guangling Dong2, Qiang Li1, Xinyu Gong1,Jihua Zhang3, Zhenhong Wang4 and Zhenglin Yu4,

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2 Control and Simulation Center, Harbin Institute of Technology,150001, Harbin Heilongjiang, China

3 Department of Artillery Test, Baicheng Ordnance Test Center,137001, Baicheng Jilin, China

4 School of Mechatronic Engineering, Changchun University of Science and Technology,130022, Changchun Jilin, China

Abstract. Development and present status of type approval test for shipborne weapon system are presented, composition and working principle of gun servo load simulator are introduced, a new method of ocean wave simulation using simulation test and evaluation technology in land type approval test of shipborne weapon system is put forward. Some focal points on ocean wave impact simulation, modeling of ship movement, modeling of impact moment for shipborne weapons, exertion of high frequency shooting impact moment, and verification validation and accreditation (VV&A) of ocean wave impact

model are analyzed with emphasis, research conclusions are given out finally.

SuA7-a
13:30-15:30
Room6
Topic: High Performance Computing and Simulation Technology

SuA7-a-1
Moment Exponential Stability of Neutral Impulsive Nonlinear Stochastic Delay Partial Differential Equations
Lei Zhang1,3, Yongsheng Ding1,3, Tong Wang1,3, Liangjian Hu2, Kuangrong Hao1,3
1 College of Information Sciences and Technology, Donghua University,China.
2 Department of Mathematics, Donghua University, China.
3 Engineering Research Center of Digitized Textile & Fashion Technology,Ministry of Education, Donghua University,China.
Abstract. In this paper, we consider the stability in pth moment of mild solutions to nonlinear impulsive stochastic delay partial differential equations (NISDPDEs). By employing a fixed point approach, sufficient conditions for the exponential stability in pth moment of mild solutions are derived.

SuA7-a-2
Research on Matching Pattern of Land Used Transfer Alignment
Yajing Yu[1], Qing Li[1], and Zhong Su[1]
1Institute of Intelligence Control, Beijing Information Science and Technology University, China
Abstract. Aiming at the problem of initial alignment of land used strap-down inertial navigation system (SINS), pointed out the advantages and particularity of the moving base transfer alignment. Make the system error as the state variables of transfer alignment model, and the relationship between matching pattern of transfer alignment and system state observer was studied, if matching patterns are different, the form of measurement equation will be different. So matching pattern is the key factor to affecting transfer alignment performance. Simulate and analysis different matching patterns to get alignment results respectively, and summarizes the principle of choosing combination matching patterns according to different terrain conditions.

SuA7-a-3
The Design of Simulation System of GPS/INS Ultra-tight Integration under High Dynamic Environment
hen Ji[1], Chuanjun Li[1], and Xingcheng Li[1]
1School of Aerospace Engineering,Beijing Institute of Technology,China
Abstract. When the carrier to do a high dynamic motion, it will lead the tracking error to increase, then the degree of nonlinearity of the detector will become large and the equivalent gain response will reduce, so it may lead the satellite signal to loss lock. This paper studies the simulation system of GPS/INS ultra-tight integration under high dynamic environment, it simulates two kinds of dynamic models and the results show the superiority of ultra-tight integration. When the GPS single interrupted, it can continue tracking by INS and it's able to quickly restore the tracking when signal recovery. Ultra-tight integration also provides a possible for GPS anti-jamming technology.

SuA7-a-4
Location Based on Passive RFID by Using Least Squares SVM
Panfeng Niu[1], Zengqiang Chen[1], Yibo Li[2], and Qinglin Sun[1]
1 Department of Automation, Nankai University, China
2 Department of Communication Engineering, Beijing Institute of Technology, China
Abstract. In this paper, two location algorithms are mentioned. One is LANDMARC, which has a good performance of anti-interference, but it is an approximate estimate and cannot get an accurate result. It heavily depends on the empirical formula and the layout of reference tags. The other algorithm proposed in this paper is the location algorithm based on least squares SVM. It uses the least squares SVM to get the mapping of RSSI to distance, and then gets the position results by using least-squares method. According to the simulation, it has a better performance comparing to LANDMRC.

SuA7-a-5
Performance Robustness Comparison of Active Disturbance Rejection Control and Adaptive Backstepping Sliding Model Control
Ying Kang[1], Donghai Li[2], and Dazhong Lao
1School of Aerospace Engineering, Beijing Institute of Technology, China
2State Key Lab of Power Systems, Dept of Thermal Engineering, Tsinghua University, China
Abstract. Active disturbance rejection control and sliding mode control are two control approaches which are claimed to have good ability and strong robustness in the control of the systems with internal uncertainties and external disturbances. But the systematic comparisons of these two control schemes are lacking in the extant literatures. In this study, Monte-Carlo experiment is adopted to test the performance robustness of these two control schemes based on the same nominal disturbance rejection ability. Simulation results show that the second-order linear active disturbance rejection control has very good performance robustness, especially for the plants with integrating element, the high order plants and the nonlinear plants.

SuA7-a-6
Research and Simulation of Surface Fitting Algorithm Based on Surface Patches Splicing
Xiaoping Qiao[1], Hesheng Zhang[1, 2], Jinxing Xu[1],

and Xiaojin Zhu[1]

1School of Mechatronics Engineering and Automation, Shanghai University,China

2Shanghai Institute of Aerospace Electronic Technology, China Aerospace Science and Technology Corporation, China

Abstract. According to differential geometry of surface theories, this paper researches on a surface fitting algorithm based on surface patches splicing. Space curved surface is decomposed into several surface patches, and then, surface model is established based on the quadratic equation. During the establishment of multiple nonlinear equations, the equal mean curvature and continuous surface works as boundary constraint conditions. For each patch, the nonlinear equations are solved by using single rank inverse Broyden quasi Newton method to obtain the parametric equation of the surface patch. Through the recursion, the patches can be spliced and it can realize the surface reconstruction. Finally, simulations are carried out in the Matlab environment and the experimental results show that the surface fitting algorithm can effectively reconstruct the large deformation surface, so it is feasible for space surfaces reconstruction.

SuA7-a-7

Convergence Analysis of Variational Iteration Method for Caputo Fractional Differential Equations

Zhiwu Wen1 , Jie Yi2, and Hongliang Liu

1School of Mathematics and Computational Science, Xiangtan University, China

Abstract. In this paper, the variational iteration method is applied to solve initial value problems of Caputo fractional differential equations. The convergence of the variational iteration method for solving the initialvalue problems of the kind of equation has been proved. The numerical examples show the e±ciency of the variational iteration method for solving the initial value problems of the kind of equation.

SuA7-a-8

Performance Study of Feature Descriptors for Human Detection on Depth Map

Yujie Shen, Pengfei Wang, Shiwei Ma*

1School of Mechatronic Engineering & Automation, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University,, China

Abstract: Since depth map contains the space information of objects and is almost free from the influence of light, it attracted much research interests in the field of machine vision used for human detection. In this paper, a depth map dataset composed of various indoor scenes with human was constructed by using Microsoft's Kinect camera as a better benchmark for the study of methods of human detection on depth map. The depth map was smoothed with pixel filtering and context filtering so as to reduce particulate noise. Then, the performances of five typical image feature descriptors used for human detection were studied and compared on the dataset through theoretic analysis and simulation experiments. Results manifest the effectiveness of proposed methods.

SuA7-b
15:50-18:10
Room6
Topic: High Performance Computing and Simulation Technology

SuA7-b-1

Numerical Simulation of Discrete Gust Response for a Free Flexible Aircraft

Dong Guo[1], Min Xu[1], and Shilu Chen[1]

[1] College of Astronautics, Northwestern Polytechnical University, China

Abstract. Gust response analysis plays a very important role in large aircraft design. This paper presents a methodology for calculating the flight dynamic characteristics and gust response of free flexible aircraft. A multidisciplinary coupled numerical tool is developed to simulate detailed aircraft models undergoing arbitrary free flight motion in the time domain, by Computational Fluid Dynamics (CFD), Computational Structure Dynamics (CSD) and Computational Flight Mechanics (CFM) coupling. To achieve this objective, a structured, time-accurate flow-solver is coupled with a computational module solving the flight mechanics equations of motion and a structural mechanics code determining the structural deformations. A novel method to determine the trim state of flexible aircraft is also stated. First, the field velocity approach is validated, after the trim state is attained, gust responses for the one-minus-cosine gust profile are analyzed for the longitudinal motion of a slender-wing aircraft configuration with and without the consideration of structural deformation

SuA7-b-2

A Study of Wireless Mobile Node Localization Algorithm Based on MCL and HS

Yan Chen[1] and Jingqi Fu[1]

1School of Mechatronic Engineering and Automation, Shanghai University, China

Abstract. This paper proposes the methods to improve the Monte Carlo (MCL) algorithm for the wireless mobile node localization. It combines the anchor boxes constructed by different power signals with the node location information in the previous time to reduce the sampling region. Through sampling and filtering in this region, we adopt the Harmony Search (HS) algorithm to optimize the obtained samples and then calculate the estimated value of the node location. Moreover, the RSSI ranging is used to assist localization. And it takes full advantage of the nodes information with high availabilities. The simulation results show that the improved algorithm reduces the requirements of anchors

density and improves the sampling filter efficiencies and the localization accuracy.

SuA7-b-3

The Research on Association Rules Mining with Co-evolution Algorithm in High Dimensional Data

Wei Lou[1], Lei Zhu[1], and Limin Yan[1]
1School of Mechatronics Engineering and Automation, Shanghai University, China

Abstract. This paper adopts a co-evolution algorithm, which utilizes improved genetic algorithm and particle swarm optimization algorithm to iterate two populations simultaneously. Meanwhile, the mechanism of information interaction between these two populations is introduced. Finally, experiments and application have been made to prove that on the premise of acceptable time complexity, not only does the co-evolution algorithm inherit the superiority of traditional genetic algorithm such as reducing the number of scanning the database effectively and generating small-scale candidate item sets, but also avoid the phenomenon of premature through comparing the properties of co-evolution algorithm, traditional genetic algorithm and particle swarm optimization algorithm when used in association rules mining. High quality association rules can be found when adopted the co-evolution algorithm, especially in high-dimension database.

SuA7-b-4

Simulated Annealing Algorithm in the Application of Thermal Reliability

Shaoxin Tian[1], Zhong Su[1], Xiaofei Ma[1], and Xu Zhao[1]
1Institute of Intelligence Control, Beijing Information Science & Technology University, China

Abstract. According to the influence of temperature on the lifespan of electronic devices, this paper uses the simulated annealing algorithm to optimize the layout of array distributed electronic components, and the finite element method to verify the result. The results show that it can effectively lower the high temperature of the electronic components through the layout optimization. The highest temperature and the average temperature are decreased by 10.49% and 10.41% respectively in this simulation, which indicates the simulated annealing algorithm can effectively solve the problem of layout optimization of components on the printed circuit board and avoid large-scale computing in the traditional algorithm. This algorithm is of practical value in the field of engineering.

SuA7-b-5

Parallel Simulation Based on GPU-Acceleration

Jun Du[1], Qiang Liang[1], and Yongchun Xia[1]
1Academy of Armored Force Engineering,Beijing, China

Abstract. GPU has much intensive computation capacity and wide bandwidth, and with the advantage of high performance and low power cost, the heterogeneous architecture of CPU and GPU make good effect in many fields. With the appearance of CUDA that carried out by Nvidia, the GPU is used for general-purpose computation is easier and cheaper, there are many high performance computation questions in simulation field, such as the simulation of the electromagnetic environment, the solution of higher order differential equations, the simulation data processing, large-scale combat simulation and so on, among these, some of the questions that are involved data-intensive computation, are suitable for acceleration by GPU. With the development and maturity of GPGPU, the heterogeneous parallel computation will play an important role in parallel simulation.

SuA7-b-6

Quantization Based Real-Time Simulation of Continuous System in Distributed Environment

Wei Zhang[1] and Jiangyun Wang[1]
1School of Automation Science and ElectricalEngineering, Beihang University,China

Abstract. Continuous system must be discretized for computer simulation. There is a kind of methods such as QSS method that discretizes the continuous system based on the discretization of the state space except the classical methods such as Euler, Runge-Kutta, etc. It is proved that the quantization based method would reduce the redundant caculation while guarantee the accuracy. It has always been proved that QSS method would guarantee the stability and convergence under some conditions. QSS method discretizes the continuous system to discrete-event model and each model could be treated as a federate in HLA. The real-time simulation in HLA is supported by a special federate called RTFederate. At last, an example would be introduced to prove the method.

SuA7-b-7

Modified Self-adaptive Strategy for Controlling Parameters in Differential Evolution

Tam Bui[1], Hieu Pham[1] and Hiroshi Hasegawa[2]
1Graduate School of Engineering and Science,Shibaura Institute of Technology, Japan
2College of Systems Engineering and Science,Shibaura Institute of Technology, Japan

Abstract. In this paper, we propose a new technical to modify the self-adaptive Strategy for Controlling Parameters in Differential Evolution algorithm (MSADE). The DE algorithm has been used in many practical cases and has demonstrated good convergence properties. It has only a few control parameters as NP (Number of Particles), F (scaling factor) and CR (crossover), which are kept fixed throughout the

entire evolutionary process. However, these control parameters are very sensitive to the setting of the control parameters based on their experiments. The value of control parameters depend on the characteristics of each objective function, so we have to tune their value in each problem that mean it will take too long time to perform. We present a new version of the DE algorithm for obtaining self-adaptive control parameter settings that show good performance on numerical benchmark problems.

SuA7-b-8

Research on An Integrated Real-time Simulation Platform for Aircraft Control System

Chao Shen[1], Xiaohang Chang[1], Jinxia Liu[1], and Jingyan Han[1]

1Beijing Electromechanical Engineering Institute, china

Abstract. In order to meet the requirements of hardware-in-the-loop simulation for aircraft control system, an integrated real-time simulation platform is presented, then its functions, working principal, and architecture are introduced in detail. Analyzed several key technologies such as memory database, real-time simulation and general simulation modeling; with the advantages of high universality, integration and flexibility, this platform can effectively support the development and execution of real-time and hardware-in-the-loop simulation.

SuA7-b-9

Clock Synchronization Method for Distributed Real-Time Simulation Based on Multilayer Network Architecture

Xinbo Wang[1],and Jiangyun Wang[1],

1Beihang University, School of Automation Science and Electrical Engineering, China

Abstract. In order to achieve synchronous propulsion of real-time distributed simulation based on multi-layer network, this paper designed a clock synchronization method for this multi-layer architecture. The realization of Real-time Ethernet Layer's synchronization is based on industrial Ethernet PowerLink protocol, and the realization of Hard Real-time Layer's clock synchronization is take advantage of the reflective memory card's Network Interrupt. This paper also designed the Interlayer clock alignment strategy between Real-time Ethernet Layer and Hard Real-time Layer. The test results show that the overall performance can meet the requirements of millisecond-level real-time simulation system.

SuA7-b-10

The Simulation Evaluation System for Weapon Operational Effectiveness Based on Knowledge Management

Song Jiao, Wei Li, Ping Ma, Ming Yang

Control and Simulation Center, Harbin Institute of Technology, Harbin, P. R. China

Abstract. The objective of the simulation evaluation system for weapon operational effectiveness based on knowledge management is to solve the problem that the evaluation activities need the participation of many experts in different fields. Three types of expert knowledge models used in evaluation activities and the general design of the evaluation system were proposed. The evaluation system has been applied in many evaluation activities and the results show that it can improve the efficiency of simulation evaluation for weapon operational effectiveness and reduce the cost for employing experts.

SuA8
13:30-15:30
Room7
Topic: Cloud simulation technology

SuA8-1

The Application of Dynamical Management Based on Ontology-based Simulation Case-based Description and Reasoning

Xiayi Gong 1, Bohu Li1 ,Xudong Chai2, Yabin Zhang1, and Mu Gu2

1. Beijing University of Aeronautics and Astronautics,China

2 .Beijing Simulation Centre , China

Abstract: To meet the requirement of simulation resource description dynamical management by the technology of simulation system environment dynamically building in Cloud Simulation Platform(CSP), the application of dynamical management based on ontology-based simulation case-based description and reasoning has been presented. This method could generate description intelligently, when simulation users cannot give the exact one, so as to provide the basis for dynamical building in CSP. With the CBR, the paper mainly discussed the ontology-based expression and reasoning. Finally, the description of simulation case and the ontology-based reasoning rule are present to show the feasibility and effectiveness.

SuA8-2

Virtual Machine Task Allocation for HLA Simulation System on Cloud Simulation Platform

Shaoyun Zhang [1], Zhengfu Tang [2], Xiao Song [1], Zhiyun Ren [1], and Huijing Meng [1]

1Science and Technology on Aircraft Control Laboratory, School of Automation Science, Beihang University, China

2Key Lab of Complex Aviation System Simulation, China

Abstract. A new yet promising technology, Cloud computing, can benefit large-scale simulations by providing on-demand, everywhere simulation services to users. In order to enable multi-task and multi-user simulation tasks with Cloud computing, Cloud Simulation Platform (CSP) is proposed and developed. To promote the running efficiency of HLA systems on CSP, this paper proposes an approach addressing the Virtual Machine task allocation problem, which is divided

into two levels of task allocation steps. The first-level uses a heuristic algorithm to optimize the mapping from federates (of HLA system) to virtual machines (of CSP) and aims to achieve load balance on virtual machines in CSP. The second-level dispatches the subtasks of federate to the cores of virtual machines to minimize the makespan (schedule length) of the federate which uses a DAG based list scheduling algorithm: the EST (Earliest-Start-Time) algorithm. Experiments show that the two-level task allocation strategy effectively improves the running efficiency of HLA system on CSP.

SuA8-3

HLA Collaborative Simulation Oriented Virtual Machine Task Scheduling Strategy

Zhiyun Ren[1,2], Xiao Song[1,2], Lin Zhang[2], and Shaoyun Zhang[1,2]
1Science and Technology on Aircraft Control Laboratory, Beihang University, China
2School of Automation Science and Electrical Engineering, Beihang University, China

Abstract. Aim at the lack of embedded load balancing mechanism in HLA simulation system and the heterogeneity of resources in the network modeling and simulation platform, the study of the initial deployment of HLA simulation task is performed. At first, a unified description model of the federation is established based upon the repulsion and pull relationship between federates; And then, using the analysis of the unified description model, a first detect first combine based coarse combination algorithm is proposed; Taking full consideration of load balance and the late migration efficiency, a Huffman coding tree based fine-grained combination algorithm is put forwarded. Finally, cloud computing simulation platform---CloudSim is utilized to perform the simulation experiment, the result demonstrates that the algorithm improves the management efficiency, fault tolerance and QoS of the resource.

SuA8-4

Scenario Driven Lifecycle Automation of Net-centric Simulation

Chen Yang[1], Xudong Chai[2], and Faguang Zhang[1]
1School of Automation Science and Electrical Engineering, Beihang University, China;
2Beijing Simulation Center, China

Abstract. By introducing virtualization technology, cloud simulation platform can break tight coupling between soft simulation resources (OS, software, model, etc) and computing resources, shield the heterogeneity of underlying computing hardware, and flexibly divide computing resources, which makes the simulation task scheduling agile, transparent and efficient. Due to the characteristics of co-simulation: consistency and close coupling of time and space, one abstract description model of both co-simulation task and computing resources in cloud simulation is proposed, and then two task scheduling models based on different objectives and constraints are put forward, including models for green energy-saving and minimal time span respectively. Finally, the aforementioned scheduling models applied in one aircraft virtual prototype co-simulation are discussed in detail which proves their advantages, and also future work is presented.

SuA8-5

Research on Co-simulation Task Scheduling Based on Virtualization Technology under Cloud Simulation

Chen Yang[1], Xudong Chai[2], and Faguang Zhang[1]
1School of Automation Science and Electrical Engineering, Beihang University, China;
2Beijing Simulation Center, China

Abstract. By introducing virtualization technology, cloud simulation platform can break tight coupling between soft simulation resources (OS, software, model, etc) and computing resources, shield the heterogeneity of underlying computing hardware, and flexibly divide computing resources, which makes the simulation task scheduling agile, transparent and efficient. Due to the characteristics of co-simulation: consistency and close coupling of time and space, one abstract description model of both co-simulation task and computing resources in cloud simulation is proposed, and then two task scheduling models based on different objectives and constraints are put forward, including models for green energy-saving and minimal time span respectively. Finally, the aforementioned scheduling models applied in one aircraft virtual prototype co-simulation are discussed in detail which proves their advantages, and also future work is presented.

SuA8-6

A Service Encapsulation Method in Cloud Simulation Platform

Wensheng Xu[1], Lingjun Kong[1], Nan Li[2], and Jianzhong Cha[1]
1School of Mechanical, Electronic and Control Engineering, Beijing Jiaotong University, China
2School of Material and Mechanical Engineering, Beijing Technology and Business University, China

Abstract. In a cloud simulation platform, there exist a large number of simulation software tools that need to be encapsulated as services that can be invoked conveniently when required in the product development process. An appropriate architecture for encapsulating and managing these software tools are needed to facilitate the management of these simulation resources. In this paper, the service object-oriented architecture (SOOA) is adopted to construct the service sharing environment for engineering software on the dynamic network, and the SOOA-based two-stage service encapsulation method for engineering software is proposed. With this method, simulation software tools can

be encapsulated and deployed as services conveniently without the need of programming, and the encapsulated services can be invoked and accessed conveniently through a standard Web browser via the cloud simulation platform portal.

SuA8-7

CAE Services on Cloud Computing Platform in Sourth Korea

Sang-Hyun Cho[1]
1KITECH, 7-47, Songdo-Dong, Yeonsu-Ku, Incheon, 406-840, South Korea

Abstract. We, KITECH, had developed CAE software for casting industries(foundries) over last 10 years, and distributed the developed CAE package for foundries in south korea. But the gorwth rate of market for CAE technologies becomes slower because of expensive prices of CAE tools and lacks of trials for introducton of new technologies into their manufacturing workplaces. So that we have been developing new concept market for CAE tehcnologies for last 5 years, and built cloud platform services for CAE in south korea, and it is ISC(Internet Simulation Center). We setup cluster computing systems, datacenter for infrastructure, and developed various services and relational interfaces to serve cloud computing services. So that we have loaded 4 CAE contents into our cloud computing platform, and are providing CAE services to domestic users.

SuA8-8

Self-Adjustment Double Chains Quantum GeneticAlgorithm and Its Application

Ni LI, Haipeng KONG
1School of Automation Science and Electrical Engineering Beihang University Beijing, China

Abstract. Aiming at solving the following two problems that it takes a long time for the Double Chains Quantum Genetic Algorithm (DCQGA) to accomplish local search and DCQGA can be easily trapped into local search in a period of time, this paper proposes a Self-Adjustment Double Chains Quantum Genetic Algorithm (SDCQGA). At first, this paper gives the definitions of Step Evolution and Evolution Patience Step. Then Evolution Adjustment Strategy (EAS) and Mutation Probability Formula (MPF) are proposed. EAS constrains the quantum gate (Q-gate) rotation times and all individuals get their own mutation probabilities by means of MPF in every iterative process. At last, to demonstrate the effectiveness and applicability of SDCQGA, three application examples are carried out on continuous optimization problem. The experimental results show that the SDCQGA performs better, and with little time consumed compared to the DCQGA.

SuA9
15:50-18:10
Room7

Topic: Embedded computing and simulation technology/ Simulation Language and Intelligent simulation system

SuA9-1

A Method of Integrating Simulation with C^2 System

Wei Chu[1] and Xing E Yan[1]
Science and Technology on Information Systems Engineering Laboratory,Nanjing, China,

Abstract. In the military simulation area, providing environment for C2(Command and Control) systems is a main application of simulation. The interoperation technique between simulation and real system is increasing attention. This paper analyzes the demand of integration between simulation and C2 system, and then provides the interactive models. In the meantime, this paper brings forward a method of integration which is proved by practical application that this method can eliminate the drawbacks of traditional methods.

SuA9-2

An Implementation of FlexRay Bus Data Communication

Tingyao Liu1 , Yueli Hu1,2, Longjie Wang2 , and Chao Yu2,
1 School of Mechatronics Engineering and Automation, Shanghai University,China
2 Key Laboratory of Advanced Display and System Application, Shanghai University, China

Abstract. The traditional bus in vehicle, like CAN and LIN, can not meet the requirement of some control systems in reliability and high speed. In order to realize the reliable and High-speed FlexRay bus communication, a FlexRay bus data communication implementation scheme is put forward in this paper, and a specific Brake-By-Wire system based on the scheme is designed. The experimental results show that no matter in high-speed or in reliability the scheme have shown a good performance. It can be predicted that the implementation scheme of FlexRay bus communication also can be applied to other X-By-Wire systems like Steer-By-Wire and so on.

SuA9-3

The Design and Simulation of a Two-Layer Network Protocol for Industrial Wireless Monitoring and Control System

Zhile Yang1,2, Minrui Fei1,2,Weiyan Hou1,3, and Bingchen Wang1,2
1Shanghai Key Laboratory of Power Station Automation Technology
2School of Mechatronics Engineering and Automation,Shanghai University,China
3School of Information Engineer,Zhengzhou University,China

Abstract. As the vital compliment of existed wired monitoring and control network, wireless systems, which share the 2.4GHz channel, are gradually introduced into the industrial application field. A previous research WICN (Wireless Industrial Control Network)-a token ring based network is

limited by its single hop short range. A novel protocol named WICN-TL (Wireless Industrial Control Network-Two layers) is designed to deal with the distance problems of its predecessor. The paper introduces the topological structure, the stack model, the data format and the communicating procedure of the protocol. Moreover, the network protocol stack is implemented on the NanoNET hardware platform based on the IEEE802.15.4a standard and tested in a sewage plant and a turbine power simulation platform. The result shows that the network based on the protocol performs well in communication and the covered range is sufficient to apply to the normal industrial application demand.

SuA9-4

Application of STM32 Microcomputer in the Design of Pressure Sensor Compensation

Jianmin Wang1, Yongxin Mou2, Junqin Huang1, and Xiaodong Liu1
1. School of Automation Science and Electrical Engineering, Beihang University, China
2. Huayou Beijing Service Corporation, China

Abstract. The use of STM32 microcomputer in the design of sensor compensator is implemented based on the principle of pressure sensor compensation. According to the characteristics of small size, low power consumption and high performance, the smallest system of STM32 microcomputer is designed to install in the compensation link of pressure sensor after debugging successfully. The results of experiment presented the dynamic response of the pressure sensor stepped up, band was widened, and stability was enhanced after adding this compensator, which reached the desired effect and proved the feasibility of this method.

SuA9-5

The Mechanism of Abnormal Detection and Distributed Localization of Nodes Based on Trust Management in WSN

Kun Chang , Qingwei Liu1, Mandan Liu1, and Hailong Xiong1
1 Key Laboratory of Advanced Control and Optimization for Chemical Processes
(East China University of Science and Technology) ,Ministry of Education, Shanghai ,China

Abstract. The fault of Beacon nodes, as well as the interference in radio channel environment, will all affect the performance of localization. To eliminate these interference factors, a new distributed localization algorithm is proposed based on trust management. Firstly the algorithm splits WSN into several clusters with a certain cluster protocol, and then initiates the global trust rating (GTR) and local trust rating (LTR) of Beacon nodes. To get more precise location, it needs to localize frequently and update the GTR and LTR of beacon nodes. Theoretical analysis and simulation results show that the method can not only improve the precision of the positioning, but can also be used to examine abnormal beacon nodes and infer possible interference factors in wireless channel.

SuA9-6

Design for Home Robot Simulation Based on DFS

Lanchao Zheng[1], and Wanmi Chen[1]
1School of Mechatronics Engineering and Automation,Shanghai University, China

Abstract. A method for path finding of the home robot is presented in this paper. This method is based on Depth First Search (DFS) to find the optimal path of the Home Robot Simulation.DFS is an algorithm for traversing or searching a tree, tree structure, or graph. One starts at the root (selecting some node as the root in the graph case) and explores as far as possible along each branch before backtracking. Applied to @Home Simulation Competition, this method can achieve good effect. It is proved that the algorithm used in Home Robot Simulation is with high speed and accuracy.

SuA9-7

Working Process Simulation Analysis on an Diesel Injector with Different Needle Valve Parameters

Yulan Li[1], Xiangbi An[1], and Dahai Jiang[1]
1Automobile Engineering Department, Academy of Military Transportation, China

Abstract. The injector is a key component of the diesel fuel oil injection system, which directly affects the performance of the diesel engine. And the needle valve is a vital part for the injector. In order to analyze the effect of the needle valve parameters on injection performance, the simulation model of a certain type diesel injector was established based on AMESim. And a simulation for a whole injection cycle of this injector was performed, thus the injection characteristics and the relevant information about motion of the needle valve was obtained. The effect on the velocity of the needle valve, the flow rate and the quantity of the fuel oil injection, etc. had been analyzed by changing the needle valve parameters such as the preload of the pressure regulating spring, the needle valve diameter, and the orifice diameter. The analysis would provide some references in structure design, optimization, test data analysis and fault diagnosis.

SuA9-8

Research on SDEM and its Transformation in the Gateway Design

Xu Xie[1], Xiaocheng Liu[1], Ying Cai[1], and Kedi Huang[1]
1System Simulation Lab, College of Mechatronics and Automation,National University of Defense Technology, China

Abstract. Gateway refers to an intelligent translator which converts data between heterogeneous systems, to make the systems be able to interpret the received data according to their desired format. Setting up translations between data elements is the key of the gateway design. In this paper, we discuss how to formally

set up these translations, resulting in two products: 1) a XML (eXtensible Markup Language) based model called Simulation Data Exchange Model (SDEM). A SDEM refers to the representation of information about objects shared via distributed simulation. It is the foundation of the formal description of translations. 2): a XML Schema based format to describe translations based on the SDEM mapping. The two products make it possible to create well-documented translations which can be reused in future activities, and in addition, we can easily verify the consistency and completeness of the resulting translations which will reduces the chance for errors.

SuA9-9

P-HASE: An Efficient Synchronous PDES Tool for Creating Scalable Simulations

Yanyong Mongkolsin[1] and Worawan Marurngsith[2]
1Department of Computer Science Faculty of Science and Technology, Thammasat University,Thailand

Abstract. Synchronous, parallel discrete event simulation (PDES) is the simplest and lightweight approach to speedup large-scale simulations by scheduling as many events, of the same simulation cycle, to be executed concurrently. The scheduling technique to achieve perfect load balance and scalability is a key challenge for an efficient synchronous PDES. In this paper, we proposed a technique for balancing loads to fit the number of available processors on multicores. The technique has been implemented on a synchronous PDES tool called P-HASE (the Parallel - Hierarchical computer Architecture design and Simulation Environment) using the NET 4.0 concurrency runtime and OpenMP. Eight simulation models have been evaluated on 4-, 8-, and 16- core machines. The results show that the models using P-HASEare faster than HASE for 18 – 6.5 times; and maintain their performance when changing the numbers of processors. The results confirm that the simulation models created by using the P-HASE tool are highly scalable for multicore architecture.

SuA9-10

A Transmission Particle Model for Electromagnetic Calculation and its Simulation Verification

Lan Mu1, Lin Zhang1, lei Ren1
1 School of Automation Science and Electrical Engineering Beihang University Beijing, China

Abstract. Based on ray-tracing method, a transmission particle model (TPM) for calculating electromagnetic field is presented combining the particle method. The movement of a particle obeys the principle of the propagation of electromagnetic wave, and then the particle distribution density in space reflects the distribution status of electromagnetic. The algorithm with particle transmission, movement, reflection, and diffraction, are described in detail. Deduction verification of TPM is conducted. Finally, the simulation comparisons are made against the ray-tracing method. The simulation results verified the effectiveness of the proposed method.

SuA10
13:30-15:30
Room8
Topic:Others

SuA10-1

Closed-loop Subspace Identification Algorithm of EIV Model Based on Orthogonal Decomposition and PCA

Jianguo Wang1, Yong Guo1 , and Juanjuan Wang1
1Department of Automation, School of Mechatronics Engineering and Automation; Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China

Abstract. In this paper, after analysis of the reason why some existing subspace methods may deliver a bias in the closed-loop conditions, a new SIM for closed-loop system based on orthogonal decomposition and principal component analysis is proposed by adopting the EIV model structure. Then, the underlying reason why SIMPCA-Wc delivers a bias estimate is explained from realization theory of closed-loop system based on orthogonal decomposition. At last, simulations show that the proposed method ORT_PCA-Wc used for closed-loop EIV system is effective and feasible.

SuA10-2

A Robust Physics-based 3D Soft Tissue Parameters Estimation Method for Warping Dynamics Simulation

Xiangyun Liao 1, Zhiyong Yuan1, , Zhaoliang Duan1, Weixin Si1, Si Chen1,
Sijiao Yu1, and Jianhui Zhao1
1.School of Computer, Wuhan University, China

Abstract. Soft tissue warping is one of the key technologies in dynamic simulation of many surgical procedures. To achieve high performance simulation of 3D soft tissue warping, the research of physical parameters estimation of the warping model is of great significance. Through the construction of parameters estimation platform which consists of an optical tracking system PPT2 (Precision Position Tracker with 2 Cameras) and pressure acquisition devices, we obtain the nodal displacements of tetrahedron finite element model and external forces on it. Then we calculate the parameters of 3D soft tissue by using reverse engineering method and verify the parameters by comparing the calculated nodal displacements and the measured nodal displacements of the soft tissue. The experimental results show that the Physics-based 3D soft tissue parameters estimation method we proposed have achieve accurate agreement of calculated nodal

displacements and the measured nodal displacements and it has the properties of accuracy and robust;

SuA10-3

Command and Control Evolutive Network Models for Command Substitution

Lidong Qian[1] and Xiao Song[1]
1Science and Technology on Aircraft Control Laboratory, School of Automation Science and Electrical Engineering, Beihang University, China

Abstract. Due to the damage of commander or command post in battlefield, it often appears the substitution of command right of C2 (Command and Control) nodes. Firstly, this paper analyzes information exchanging in C2 network and builds a classic army C2 network. Secondly, three kinds of command substitution such as backup-command, junior-command and bypass-command are concluded according to the actual combat, which also means that three evolutive networks are built based on the three evolutive rules. It shows that the original network and its evolutions all present different degree of complex network characteristics. Finally, based on communication decision-making model, it shows the diversity of synchronization in different networks with Netlogo simulation software and draws the conclusion that the synchronization of network by using backup-command is better than other two evolutive networks.

SuA10-4

Fluid Motion Vector Calculation Using Continuity Equation Optimizing

Maomao Wu1 and Hongyan Quan 1
1 No. 3663 Zhongshan North Road, Shanghai, East China Normal University Science Building B219

Abstract. It is very important to calculate fluid motion vector for natural landscape modeling of virtual reality interaction. This paper presents a new method of landscape fluid motion vector calculating. First, we use Plessy operator to extract feature points from two images and to calculate the match points using the area correlation matching method. Then the linear interpolation method with the shortest distance is used to interpolate the calculated motion vector to obtain dense fluid motion vector result. At last, we use the fluid continuity equation to optimize the dense fluid motion vector field to obtain dense and more accurate fluid motion vector calculation results. Further experimental results show that this method has the characteristic of simple and accurate. It is a valid method of fluid motion calculating and be used in the application of fluid simulation and virtual reality study.

SuA10-5

A Comparison of Multi-objective Evolutionary Algorithms for Simulation-based Optimization

WenJun Tan[1], Stephen John Turner[1], and Heiko Aydt[1]
1Nanyang Technological University, Singapore

Abstract. Simulation-based optimization is an important tool in science, engineering, business and many other areas. Optimization of a real-world physical system often involves multiple (and sometimes conflicting) objectives. This gives rise to a situation where a set of optimal solutions, also known as the Pareto-optimal front (POF), is applicable. For non-trivial problems, the number of possible solutions is typically very large. This makes it impossible to apply an exhaustive search to find all possible solutions in the POF in a reasonable time. By applying heuristic search algorithms, such as evolutionary algorithms, it is possible to search for Pareto-optimal solutions without having to evaluate the entire search space. While heuristics can help to reduce the number of solutions that need to be evaluated, there is still the issue of having to perform multiple simulation replications due to the stochastic nature of many simulation models. Since simulation is time-consuming, it is important to implement a computing budget allocation scheme to ensure the simulation is completed within a reasonable time. The research presented in this paper examines the impact of dynamic computing budget allocation on the performance of evolutionary algorithms with respect to the quality of solutions. The results show that the use of dynamic computing budget allocation in combination with an integrated evolutionary algorithm has comparable performance while using less computing budget when compared to a standard approach

SuA10-6

Fluid Motion Estimation Based on Energy Constraint

Han Zhuang[1] and Hongyan Quan[1]
1No. 3663 Zhongshan North Road, Shanghai, East China Normal University Science Building B 219

Abstract. This paper presents a method for motion estimation of fluid flow in natural scene. Due to drastic brightness changes in images sequence, previous methods based on continuity equation or brightness consistency constraint cannot be applied in this context well. We define Brightness Distribution Matrix (BDM) to present regional brightness. In the initialization of motion field, the BDM consistency between original point and corresponding point is used as a constraint. Towards the incorrect motion vector caused by drastic brightness change, we denoise to the initial motion field by statistical method, and then a novel smoothness constraint is applied to optimization for denoised motion field. The results of natural fluid flow in images show the validity of our method and the obtained motion field can be used to process 3D recovery for fluid flow.

SuA10-7

Optimization of Space Color Mapping using Compactly Supported Radial Basis Functions for Color Repro

Ladys Rodriguez1, Luis Diago2, and Ichiro Hagiwara1,2
1 Institute for Advanced Study of Mathematical Sciences (MIMS), Meiji University, Japan
2 Department of Mechanical Science and

Engineering, Tokyo Institute of Technology, Japan
Abstract. Colors play an important role for customers to find their preference.The perception of the color depends on the devices used to show the colors and it changes with the color transformation between one device and another. This paper proposes an optimization of the Compactly-Supported Radial Basis Functions (CSRBF) space mapping to minimize the error in the color conversion between the system and the printer color spaces. A clustering k-means method is used to select the representative data in the printer color space to reproduce the whole space with high accuracy. The calculation of optimized CSRBF parameters using the representative data is proposed to minimize the color difference between the predicted CSRBF color value and the printed color value of all data in the printer color space. Proposed optimization method finds the optimized CSRBF parameters values and the optimal weighting parameters for color differences evaluation.

SuA10-8
An Approach to Optimized Resource Allocation for Cloud Simulation Platform
Haitao Yuan1, Jing Bi2, Bohu Li1,2, Xudong Chai2
1 School of Automation Science and Electrical Engineering, Beihang University, 100191 Beijing, China
2 Beijing Simulation Center, 100854 Beijing, China
Abstract. Resource allocation for simulation applications in cloud simulation environment brings new challenges to infrastructure service providers. In order to meet the constraint of SLA and allocate the available virtualized resources optimally, this paper first presents autonomic resource management architecture, and then proposes a resource allocation algorithm for infrastructure providers who want to minimize infrastructure cost and SLA violations. Our proposed
algorithm can maximize the overall profit of infrastructure service providers when SLA guarantees are satisfied or violated in a dynamic resource sharing cloud simulation platform. The experimental evaluation with a realistic workload in cloud simulation platform, and the comparison with the existing algorithm demonstrate the feasibility of the algorithm and allow a cost effective usage of resources in cloud simulation platform.

SuA12
15:50-18:10
Room8
Topic: Visualization

SuA12-1
The Research on Visual Flight Simulation for Unmanned Helicopter
Jianbin Ye, Hongwu Guo, Shuai Tang, and Qi Wang
1College of Mechatronics and Automation National University of Defense Technology, Changsha, China
Abstract. Unlike traditional flight simulation of unmanned helicopter usually only presenting curve pattern, this paper introduces two kinds of visual flight simulation based on dynamic model. The dynamical model of unmanned helicopter is built by eight parts which consists of main rotor, tail rotor, fuselage, vertical fin, rigid-body dynamics, the angular kinematics and so on. Then the PID algorithm is designed to control the helicopter, and the visual flight simulations are achieved by Matlab/Simulink and Matlab/Flightgear respectively. The results of the simulations are acceptable.

SuA12-2
Research of Large Terrain Multithreading Fast Scheduling Based on the OSG
Xiying Huang[1], Wei Shao[1], and Dinghai Zhao[1]
1Academy of Armored Force Engineering, Beijing, China
Abstract. In the field of 3D terrain visualization, the contradiction between massive terrain data volume and the rendering efficiency is growing increasingly, and many scheduling arithmetic of large terrain have been put forward. In this paper, we build the improved four forks model according to characteristic of the large terrain data volume, discuss the storage mechanism and index structure, and then construct the multithreading scheduling mechanism. At last we achieve the large terrain rendering using OSG.

SuA12-3
Semi-transparent and Fused Visualization of Tetrahedral Simulation Volume Data
Asuka Sugiyama[1], Kyoko Hasegawa[2], Susumu Nakata[2], and Satoshi Tanaka[2]
1Graduate School of Information Science and Engineering, Ritsumeikan University, Japan
2College of Information Science and Engineering, Ritsumeikan University, Japan
Abstract. In the fields of science, medicine and engineering, there are demands of visualizing varieties of simulation data that are often tetrahedral volume data. Therefore, precise visualization of tetrahedral volume data is important. Recently, we proposed the "particle-based surface rendering (PBSR)", Which is a kind of point rendering. We don't need to sort rendering primitives along the line of sight, so we can visualize large-scale data quickly and make sorting error not appear. Furthermore, it is easy to realize fused visualization. In this paper, we apply the PBSR to tetrahedral volume data at first, which has not been done so far. Next, we propose two kinds of fused visualization for tetrahedral data. In any case, we have not seen any rendering artifact that often appears in the traditional transparent rendering methods. The PBSR for tetrahedral volume data is beneficial to analyzing varieties of tetrahedral simulation data in scientific and medical fields.

SuA12-4

Intelligent Optimization of an Anti-torpedo Counterplan Based on Particle Swarm Optimization Algorithm

Yanyang Zeng [1,2], Fengju Kang[1,2], Huizhen Yang[1,2], Hongtao Liang[1,2], and Jianhua Xu[1,2]
1. Marine College of Northwestern Polytechnical University, China;
2. National Key Laboratory of Underwater Information Process and Control, China

Abstract. Particle swarm optimization (PSO) algorithm was advanced in the intelligent optimization of an anti-torpedo counterplan. When a submarine was attacked by torpedo and in the mean time it had to be properly maneuvered. Due to the optimal allocation problem for the acoustic warfare equipment, a typical anti-torpedo counterplan was studied, and PSO algorithm was applied in the intelligent tuning of the four controller parameters, so as to optimize the counterplan reasonably which used acoustic warfare equipments and maneuver of submarine evasion. Then combined with the Monte Carlo method, algorithm was design and simulation was conducted. By comparison, it can greatly improve the survival probability of the submarines by using the optimized scheme, which has practical significance to defense torpedo for the submarine in the undersea warfare.

SuA12-5

Realistic Simulation of Tomato Garden Based on GPU

Weilong Ding[1,2], Hujun Jin[1], Lifeng Xu[1,2] and Zhijun Cheng[1]
1College of Computer Science & Technology, Zhejiang University of Technology,China
2Key Laboratory of Visual Media Intelligent Process Technology of Zhejiang Province

Abstract. Group of plants, such as forest, grass-land, and garden, are necessary parts of natural scenes. Due to the large varieties and their natural complexity in geometry, modeling and rendering of large scenes with many plants are difficult and with challenge, which are limited by the capabilities of current graphics hardware. The objective of this study is to present a fast algorithm to simulate a virtual tomato garden based on GPUs acceleration. Parametric L-system is used to describe the topological structure of individual tomato plants. Vertex shader and fragment shader are utilized to do the computing of graphical interpretation of generated strings and the calculation of texture, light, and color of different organs, respectively. Moreover, level of detail is employed to describe different simulation level according to distance between the plant position and the viewpoint. The experiment results show that the proposed method can not only simulate the natural scene of tomato garden, but also can visually simulate the interactive behaviors between tomato plants and environmental factors.

SuA12-6

A Volume Compression Scheme Based on Block Division with Fast Cubic B-spline Evaluation

Kun Zhao [1], Naohisa Sakamoto [2], and Koji Koyamada [2]
1 Graduate School of Engineering, Kyoto University, Japan
2 Institute for the Promotion of Excellence in Higher Education, Kyoto University, Japan

Abstract. Nowadays, even though the GPU could keep up with the growing amount of volume data by boosting computation performance, the transfer bandwidth between different hardware may become insufficient especially for rendering the high-resolution volume data, which results in an important problem. This problem becomes even more conspicuous for the time-varying volume data. To overcome this bottleneck, we propose a volume compression scheme that employs tetrahedral cells generated at each sub-volume. The sub-volume is defined by applying a blocking operation to an original volume with a block size. Additional vertices at the tetrahedral cells are calculated by using the fast cubic b-spline evaluation function calculated from the original volume. We confirm the effectiveness of our compression scheme by applying it to a volume dataset which is composed of 480×720×120×122 voxels.

SuA12-7

Visualization of Slice Image with Opacity Based on Particle-based Renderer

Kyoko Hasegawa[1], Saori Ojima[2], Kozaburo Hachimura[1], and Satoshi Tanaka[1]
1College of Information Science and Engineering, Ritsumeikan University,Japan
2Graduate School of Science and Engineering, Ritsumeikan University,Japan

Abstract. This paper proposes a sampling technique to create a slice image with opacity to render the same volume. Our method is based on the particle-based rendering, which uses tiny particles as rendering primitives. In this research, three sampling methods are proposed for applying opacity: (1) Metropolis sampling of the whole plane, (2) Uniform sampling at each grid, (3) Metropolis sampling at each grid. The results show that the borderline is clearly shown in the low-opacity area using technique 2 and is clearly shown in the high-opacity area by using technique 3.

SuA12-8

Building an Inverted Pyramid Display for Group Learning

Shuhong Xu[1], Bin Wu[1], Dongyun Ge[1], Lei Chen[1], and Hongyan Yang[1]
1Beijing Aeronautical Science & Technology Research Institute (BASTRI),
COMAC, China

Abstract. This paper reports on the design and implementation of an inverted pyramid display for group learning. It is composed of an image generation subsystem, an image reflection

subsystem and a software rendering engine. Various 3D models can be loaded into the system and rendered in real-time by the software into four correlative images, each for one side of the inverted pyramid. The display is made of thin semi-transparent acrylic panels. The reflected images appear inside the pyramid and appear to float in mid-air. Users surrounding the display can view different sides of the 3D models and interact with them. Meanwhile, users can see through the display to communicate with each other easily. This kind of design provides an interactive platform for a group of learners to discuss and understand 3D structures and phenomena. This is quite different from existing reflection-based displays, which are mainly designed for exhibition and advertising. Our display system is designed for group learning and facilitates more user communication and interaction.

SuA12-9

Particle-based Transparent Texture Mapping for Implicit Surfaces

Takehiko Kitagawa, Satoshi Tanaka[2], Susumu Nakata[2], and Kyoko Hasegawa[2]

1Graduate School of Information Science and Engineering, Ritsumeikan University, Japan

2College of Information Science and Engineering, Ritsumeikan University, Japan

Abstract. The particle-based surface rendering (PBSR) is a method for transparent rendering using opaque particles and probabilistic determination of surface opacity. The target of this paper is to develop a transparent texture mapping technique in the framework of the particle-based surface rendering. Our method enables precise transparent rendering of implicit surfaces with colorful textures mapped. We investigate parallel and perspective projections of a texture image to the particles that are rendering primitives of the PBSR. We demonstrate that using our texture mapping method in the fused visualization is a unique feature of the PBSR.

SuA12-10

Research on Measurement of Decision-making Superiority based on Command and Control Network16

Shi Xuecheng1, Song Xiao1, Zhang Shaoyun1

1 Science and Technology on Aircraft Control Laboratory, School of Automation Science and Electronic Engineering, Beihang University,Beijing, China

Abstract. In order to calculate decision-making superiority of command and control (C2) network from the perspective of Network Centric Warfare (NCW), main characteristics of C2 network are modeled and analyzed. The concept of C2 cluster is proposed. Mathematical models of connectivity between nodes, collaboration between nodes, benefits and costs of network's information redundancy are given based on the concept of Cluster. An effect measuring model of the characteristics to decision-making superiority is presented. A simulation experiment of a specific C2 network is carried out to verify the correctness and rationality of the measuring model. The results provide a theoretical basis for decision-making in modern warfare C2 system.

SuA12-11

Safety Analysis of Computer-Controlled Real-Time Systems with Message Loss Using Communicating DEVS Models

Hae Sang Song[1] and Tag Gon Kim[2]

1Computer Engineering Dept., Seowon University, Korea

2Electrical Engineering Dept., Korea Advanced Institute of Science and Technology,Korea

Abstract. The Communication DEVS formalism is an analysis means for discrete event systems modeled by DEVS formalism which has been widely used as a system theoretical specification. This paper proposes a new method for analyzing safety of real-time discrete event systems using communicating DEVS formalism. It is a part of efforts toward a unified method for modeling, simulation, and logical analysis based on the DEVS formalism and associate theory. For safety analysis of such real-time discrete event systems we first define communicating DEVS and then propose a timed reachability analysis algorithm for the models. The algorithm visits all possible timed states of the model, which is not always possible by using a simulation based state traversal. The proposed method can be well used especially for DEVS-specified systems to check various logical properties such safety, liveness and so on. A case study of a safety analysis for a rail road crossing system illustrates the usefulness of the proposed method.

October 29, PM,2012 Monday

MoA13-a
13:30-15:30
Room1
Topic: Verification, Validation and Accreditation (VV&A) technology

MoA13-a-1
Behavior Event Flow Analysis: a Method of Combat Simulation Creditability Evaluation
Ming Sun1, Yalong Ma1, and Huixian Tao2,
1 Department of Equipment Command and Administration, Academy of Armored Force Engineering, China
2 Department of Computer Science and Engineering, North China Institute of Aerospace Engineering, China
Abstract. Credibility is an important part of combat simulation research, which restricts application qualities of simulation in the operational decision-making. Most of credibility evaluation methods measure the credibility by analyzing gap between simulation results and actual results, but the actual results of combat cannot be predicted. This paper brings forward a credibility evaluation method based on behavior event flow analysis, using the same form of event flow graph models to describe the battle course in simulation and theory. According to the merger thoughts, this paper also gives a strategy of contrast between the two event flow models, which can measure the flow rationality of simulation models by analyzing the event coverage degree and process matching degree between simulation logic models and theoretic logical models.

MoA13-a-2
A Simulation Model Validation Method Based on Design of Experiments
Dezhi Dong1, Jiangyun Wang1, and Ping Zhang1,
1 School of Automation Science and Electrical Engineering, Beihang University, China
Abstract. When simulation factors are numerous while real-world observed data are sparse, the issue of validating the simulation models is problematic. An extreme case is focused that limited real-world observations are available cross the factor space, and only a single replicate is available on per simulation factor setting. A method based on design of experiments is proposed by which the validation experiments could be well arranged across the factor space through optimal design. The p-value test technology is employed to evaluate the statistical consistency of the static data, and for a set of validation experiments obtained by DoE, the combined analysis of all the p-values resulted from these experiments can be taken based on the inverse-CDF theorem, to make an overall characterization of degree of the simulation credibility on the entire factor space. An example of validation of a guided missile simulation is taken to demonstrate that the method is useful.

MoA13-a-3
A Consistency Test Method for Simulation Data Considering Shape and Distance of Series
Yuwei Hu[1], Ping Ma[1], Ming Yang[1] , and Zicai Wang[1]
1Control and Simulation Center, Harbin Institute of Technology, Harbin, China
Abstract. By utilizing contrasting results between simulation data and reference data, dynamic consistency test of simulation results is an important content of model validation. In this paper, a novel consistency test method considering shape and distance of series is proposed. Based on the analysis of dynamic consistency test problem, an improved grey relational grade model is established to assess the dynamic consistency among series, which considered the shape and distance of series as two main attributes. The consistency is tested in view of similarity and nearness between series to accomplish overall test task. Meanwhile, the method is effective to test the consistency for the two sets of simulation series being symmetric of reference data. Finally, an example of consistency test for launch current of electromagnetic railgun is given to illustrate that the improved method is effective and practical for assessment of dynamic consistency of simulation data.

MoA13-a-4
Research on Credibility Evaluation Framework of Manned-Spaceflight Training Simulator
Jiangang Chao[1], Junjun Wang[1], and Pu Wang[1]
1China Astronaut Research and Training Center, Haidian District, Beijing, China
Abstract. A Manned-Spaceflight Training Simulator (MSTS) was the main training platform for Chinese astronauts. To determine the effectiveness of the training, simulation credibility of the MSTS must be verified. Therefore, this paper aims to establish a simulation credibility evaluation framework for an MSTS. Through reviewing existing evaluation systems, the evaluation framework for an MSTS was fundamentally established according to the training purpose of the simulator and the astronaut's perspective. The framework contains two parts: static simulation and dynamic simulation, which can evaluate simulation credibility from visual, audio, and psychomotor sensory experience. The applicability and accuracy of the framework was basically proved by a questionnaire given to selected users of the MSTS and technical experts. Using this

evaluation framework, the simulation credibility of an MSTS can be thoroughly scientifically tested.

MoA13-a-5

Distributed Simulation Method for Homing Missiles Guidance, Navigation, and Control

Chen Dong[1], Tao Chao[1], Songyan Wang [1], and Ming Yang[1],
1Control and Simulation Center, Harbin Institute of Technology, China

Abstract. In view of efficient models and equipments integration, a distributed simulation method orienting homing missiles GNC demonstration and performance assessment is presented. GNC system of homing missile is introduced briefly as foundation. Distributed simulation method of GNC demonstration is presented. Operation principle, time promoting, and model operation sequence are discussed. Base on this method, a distributed simulation system is developed for GNC demonstration and performance assessment. Architecture of the simulation system, including hardware structure and software structure, is illustrated. Utilizing this system, GNC system of an infrared imaging homing missile is demonstrated with consideration of laser active jamming, disturbances and model uncertainties. Simulation results are obtained for GNC performance assessment. Demonstration and performance assessment of GNC are efficient and economical by the distributed simulation method.

MoA13-a-6

Numerical Simulation and Experimental Verification for Rice Using Distinct Element Method

Tomoyuki Miyamoto1, So Noguchi1, and Shinya Matsutomo2
1 Hokkaido University, Graduate School of Information Science and Technology, Japan
2 Niihama National College of Technology, Department of Electronic Control Engineering, Japan

Abstract. Distinct Element Method (DEM) has been developed for simulating behavior of discontinuous material by considering interaction between distinct elements, i.e. particles. After confirming the validity of DEM through some analysis, we can investigate behavior of material on a chute of a Sorting Machine with DEM. In the previous paper, we have reported that DEM is useful in simulating particles with various shapes, that is sorted by a Sorting Machine. The purpose of this paper is to discuss designing for an effective chute of a Sorting Machine from DEM results. At first, a repose angle of various types of rice in a stock box was simulated and the simulation results were compared with experimental ones. Secondly, the behavior of rice on a chute of a Sorting Machine was simulated and the simulated behavior was compared with actual one. Finally, we designed an effective chute of a Sorting Machine with DEM.

MoA13-a-7

Study on Markov Chain-Based System Readiness Assessment Method

Qisheng Guo[1], Guo Li, Liang Li[1], and Jinghua Song[1]
1Department of Equipment Command & Administration The Academy of Armored Forces Engineering
Beijing, China

Abstract. System readiness level (SRL) is used to measure the maturity of a system technical scenario so as to cover the shortage of Technical Readiness Level (TRL) by adopting Integration Readiness Level (IRL). When SRL is calculated based on TRL and IRL, the maturity of the Critical Technology Elements (CTEs) and their interplay would change with time going on. Thus, when SRL is calculated based on TRL/IRL, it may have time lags and the decision made according to the SRL will be also out of time. It may cost a large quantity of time and money. In order to solve the problem, markov chain is adopted. The concept of initial distribution, transition probability matrix and stationary distribution are used to describe and obtain the initial and stationary TRL/IRL/SRL. The markov chain-based System Readiness Assessment (SRA) method can reduce the time lag of the TRL/IRL/SRL. Thanks to the advantage, decision can be made more accurately and scientifically. An illustrative example is given to test and verify the method. The method is easy to operate and can be generalized to other field.

MoA13-a-8

An Energy Based Free Boundary Asynchronous Diffusion Model for 3D Warping of Tissue Dynamics

Weixin Si, Zhiyong Yuan, Xiangyun Liao, Zhaoliang Duan, Jianhui Zhao
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Abstract. Soft tissue warping is one of the key technologies in dynamic simulation of many surgical procedures, such as image guided surgery, surgical navigation, and structure/lesion localization. Previously, we proposed a Force Asynchronous Diffusion Model (FADM) for soft tissue warping simulation. The FADM works well if a lesion or an anatomical object has a convex shape. However, in many cases, this convex assumption is invalid. In order to remedy this significant limitation, this paper presents an energy based free boundary asynchronous diffusion model. Firstly, we adopt hexahedral voxels to represent the physical model of the surface triangular mesh to improve realistic quality and computing efficiency of warping simulation. Secondly in order to meet the requirements of realistic surgical navigation and simulation, we adopt the free boundary to make the soft tissue geometrical characteristic more precisely during the warping simulation. Finally to reflect the physical warping performance of soft tissue, we optimize the process of asynchronous diffusion by using the mechanical energy of mass point to achieve realistic soft tissue warping effects. Experimental results have shown that the

energy based free boundary asynchronous diffusion model can achieve excellent performance in both real-time and realistic quality in surgical simulation.

MoA13-b
15:50-18:10
Room1
Topic: Verification, Validation and Accreditation (VV&A) technology

MoA13-b-1
Design and Research of Visual Simulation System Based on HLA
Hei Lin[1]
1Xijing University, China
Abstract. Based on the simulation technology of HLA and 3D visual display, the missile defending combat visual simulation system structure is proposed. A new method of realizing two-three dimensional linkage based on OpenGL programme to render two dimensional window is put forward. Finally, I give a missile defending system of visual simulation of the design drawing to verify the feasibility of this simulation platform.

MoA13-b-2
Summarization of Distributed Visual Simulation Technology
Yong Long[1,2], Qinhe Gao[1], Zhili Zhang[1], Jing Yuan[1,3], and Yumiao Wei[1]
1Xi'an Research Institute of High-Tech, Xi'an,China;
2The Northwestern Polytechnical University, Xi'an, China;
3The Beijing University of Aeronautics, Beijing, China
Abstract. Virtual Battlefield Environment (VBE) technology is built to meet the need of the digitized battlefield construction. Firstly, the definition, contents, function and value of VBS are introduced, and the summarization and analysis are given. Secondly, the theoretical development and present condition in engineering application are analyzed. Subsequently, the key technologies including enormous data, multi-resolution models, comprehensive force generation, high-performance distributed network and high-immersion environment are announced. Finally, some problems during present study are analsized, as well as some development prediction in future. The research achievement could enrich and perfect of technique theory and application field in VBE technology.

MoA13-b-3
UAVs Formation Flight Control Based on Behavior and Virtual Structure
Da Cai[1], Jian Sun[1], and Sentang Wu[1]
1School of Automation Science and Electrical Engineering,Beijing University of Aeronautics and Astronautics,China
Abstract. The cooperation of unmanned aerial vehicles (UAVs) can improve operational efficiency and survival probability in rescue and penetration missions. We present a new method of dynamic formation flight control of UAVs. It contains three control steps: (i) Formation Keep; (ii) Obstacle Avoidance; (iii) Formation Flight Control Based on Behavior. The method of formation flight control based on behavior is designed to solve the problem of high requirements on communication quality of traditional formation flight control based on virtual structure. The method based on behavior can reduce the requirements on wireless data update rate and enhance the ability of obstacle avoidance of UAVs. In the meanwhile, we introduce virtual structure as reference to improve the stiffness of formation flight control based on behavior. On condition that the formation is relatively stable, the new method can enhance the ability of obstacle and threat avoidance in unknown environments of UAVs and can be used for reference for the UAVs in cooperative low-altitude penetration.

MoA13-b-4
Pre-motion Based VR Object Manipulation Definitions and Preliminary Experiments
Shiori Mizuno1, Asuka Komeda1, Naoko Yoshii1, Tomoko Yonezawa2, Masami Takata1 and Kazuki Joe1
1 Nara Women's University, Nara, Nara, Japan
2 Kansai University, Takatsuki, Osaka, Japan
Abstract. In this paper, we propose a new method to manipulate objects by using user's premotion in a VR environment. Users are provided with an instinctually easy interface to VR with using their natural behaviors as their commands for manipulating VR objects. Hand pre-shaping is known as human's unconscious behavior to face a small object to be grasped. The denitions of premotions are determined by users' initial behaviors. Therefore, we present the denitions to classify characteristics of the kinds of objects and pre-motions.Using the above denitions, we develop a prototype system to validate the classications. Consequently,manipulating VR objects by premotion is possible and promising.

MoA13-b-5
Modeling and Verification of Warehouse Dynamic Scheduling Based on the IOQ Parameter of the Product
Wenqiang Yang[1] and Minrui Fei[1]
1Shanghai Key Laboratory of Power Station Automation Technology ,School of Mechatronics Engineering and Automation ,Shanghai University ,China
Abstract. With the increasing competition of market economies, many companies are pursuing higher levels of production automation in manufacturing industry. For example, the automated warehouses are employed in the field of manufacturing and processing field, in the process of which automated warehouses play a more and more significant role. Therefore, it is meaningful to have a research on the automated warehouses scheduling issue. The warehouse

scheduling algorithm is studied combining with the project on the automatic production line of an enterprise in this paper, and a warehouse scheduling optimization algorithm is proposed based on IOQ(Index of Quality) parameters. Then the process of getting the value of IOQ is also simplified by applying the idea of sparse matrix. In addition, the algorithm uses the maximum of the IOQs to schedule warehouse on line, and is compared with other warehouse scheduling algorithms. The simulation results show that the warehouse scheduling algorithm can not only improve the quality of the product effectively, but also improve the efficiency of the scheduling largely. The desired result is achieved in the end.

MoA13-b-6

A Simulation Model Validation Method Based on Functional Data Analysis

Congmin Li1, Jiangyun Wang1, Liang Han1, and Dezhi Dong1
1 School of Automation Science and Electrical Engineering, Beihang University China

Abstract. Contrapose the disaccord between simulation data and real data in the process of simulation model validation, a simulation model validation method based on functional data analysis is proposed. This method is a kind of dynamic data analysis method, the simulation data and real data can be regarded as the sample data of two random processes, so the data also can be regarded as infinite dimension vector. Fit the data for function, so the data can be tackled in function form, the correlation analysis of the two random process of the simulation model and real system can be processed through the function data sample, the simulation model validation can be realized. This method proposes a new metrics to evaluate the credibility of the simulation model without the requirement of the time series consistency of simulation data and real data. An example is provided to prove the feasibility of the method.

MoA13-b-7

3D Gesture Based View Manipulator for Large Scale Entity Model Review

Hye Jin Park1, Jiyoung Park2, and Myoung Hee Kim1,2
1 Dept. of Computer Science & Engineering,Ewha Womans University,, Korea
2 Center for Computer Graphics and Virtual Reality, Ewha Womans University, Korea

Abstract. Hand gesture-based Human Computer Interaction (HCI) is one of the most natural and intuitive methods of communication between humans and machines because it closely mimics how humans interact with each other. Its intuitiveness and naturalness are needed to explore extensive and complex data or virtual realities. We developed a 3D gesture interface to manipulate the display of a 3D entity model. For gesture recognition, we use the Kinect as a depth sensor to acquire depth image frames. We track the position of the user's skeleton in each frame and detect preset gestures. By simple gestures, the user can pan, zoom, rotate, and reset the view and freely navigate inside the 3D entity model in the virtual space. The proposed gesture interface is integrated with the stereoscopic 3D model viewer that we have previously developed for 3D model review.

MoA13-b-8

The Research Review on VV&A Working System of Complex Simulation System

Shuli Zhang1, Huapin Geng[1], Jiahui Tong[1], and Mingran Du[1]
1Beijing Electromechanical Engineering Institute, China

Abstract. From the aspect of management and technique, this paper describes the necessity and basic thinking of making the research on VV&A working system in complex simulation system, and also proposes the specific details and suggestions. This will provide much support for formulating VV&A in complex simulation system.

MoA13-b-9

Research on network simulation task community service selection algorithm

Sun Liyang12 , Lin Jianning 2,Ju Zhenqi2, Lu Di3, Mao Shaojie2, Liu Zhong4
1 .School of Electronic and Optical Engineering Nanjing University of Science and Technology, NJUST
2. Science and Technology on Information system Engineering Laboratory CETC 28th Nanjing, China
3College of Design North Carolina State University Carolina, US
4School of Electronic and Optical Engineering Nanjing University of Science and Technology, NJUSTNanjing, China

Abstract- As a new application requirements of network simulation, how to dynamically integrate the distributed various services on network to form a new simulation task community which meets the needs of different users has become current research focus. This paper proposes a dynamic global QoS optimization service selection (DGOSS) algorithm and adopts an improved particle swarm optimum (PSO). The DGOSS can overcome traditional PSO shortcomings that may easily fall into local optima or have slow convergence rate. The DGOSS has dynamic inertia weight and an alternative method of mutation. Finally, we choose typical functions to experiment and prove the algorithm can not only improve the convergence speed of service options, but also avoid the algorithm into a local optimum. Besides practical application of simulation task community is introduced detailed, indicating the feasibility and effectiveness of the algorithm.

MoA14
13:30-15:30
Room2
Topic: CAD/CAE/CAM/CIMS/VP/VM/VR

MoA14-1

Seismic Analysis and Fatigue Life Analysis of Slat-leg Rigid-frame Bridge

Haipan Zhou[1], Chunping Zeng[1], and Guangmin Wu[1]

1School of science, Kunming University of Science and Technology,China

Abstract. On the foundation of seismic researches and fatigue life prediction by scholars of home and abroad, a dynamic model of slant-leg rigid-frame bridge, which is across Tangkou to Tunxi highway, is built by ALGOR software based on the principle of element in this paper. Earthquake-resistant ability of slant-leg rigid-frame bridge is analyzed by means of response spectrum theory, and then the force and displacement of each vibration mode are discussed, thus seismic performance of bridge is analyzed. At the same time, the fatigue damage of ramp of slant-led rigid-frame bridge after the earthquake is analyzed by employing the SN curve. Experimental results show that the slant-leg rigid-frame has a certain seismic performance, however, the shortest place of fatigue life of bridge mainly focus on the arc and the top of the pier of the bridge. This study provides a reference to similar bridges for seismic researches and fatigue life prediction.

MoA14-2

Research on the Rapid Slicing Algorithm for NC Milling Based on STL Model

Xiaohu Huang[1], Yuan Yao[1,2], and Qingxi Hu[1,2]

1.College of Mechanical Engineering and Automation, Shanghai University, China

2.Shanghai Key Laboratory of Mechanical Automation & Robotics,
Shanghai University, China

Abstract. This paper presents a new rapid slicing method for NC milling based on STL model. Firstly we establish a hash table to store coordinates of slicing planes. All the slicing planes that are intersecting with a given triangular facet can be quickly found through searching the hash table. Then we can calculate the intersecting lines and connect them to form the contours. In layered process each triangular facet was searched only once and do not need to create complex topology for the read in STL model. The results obtained by this layering algorithm can be used in NC milling based on STL model.

MoA14-3

Study on Behavior Simulation of Virtual Object Based physically Attribute

Yunbin Yang[1], Liangli He[1], Huaiyu Zhang[1], and Lifan Wei[1]

1Institute of Structural Mechanics, China Academy of Engineering Physics, China

Abstract. Because modeling and simulation method based physically attribute is complicated and simulation process is real-time in virtual assembly and virtual maintenance at present, the application of modeling and simulation base physically attribute is restrained. Product hierarchy information model and its implementation method are established, and modeling method based physically attribute is illuminated. Behavior attribute description of virtual object is analyzed by matrix, and behavior attribute of virtual object is depicted for virtual manipulation of grasp/placement, movement and falling. Behavior simulation method of virtual object is analyzed which includes force simulation method, movement controlling method and realization method of behavior simulation. Behavior simulation and its engineering application are illuminated by an actual engineering example.

MoA14-4

Research on Automatic Large Scale Terrain Modeling

Bo Liu1, Ying Ding1, and Jin Yan1

1 School of Automation Science and Electronic Engineering, Beihang University,China

Abstract. As manual interventions in conventional large scale terrain modeling process results in low efficiency, this paper proposes an automatic terrain modeling method (ATMM) aiming to reconstruct terrain meshes taking advantage of remote sensing images with few manual interventions. The modeling method includes acquiring and processing digital elevation model (DEM), establishing topological relations between spatial points and interpolating elevation. Definitions and basic properties of several existing Delaunay triangulations are discussed and the spatial points' topologies are constructed with the Delaunay triangulation template in Computational Geometry Algorithms Library (CGAL). An algorithm efficiency validation on a terrain with 18750 × 18750 points demonstrates the ATMM is acceptably competent for accelerating the speed of terrain modeling procedure.

MoA14-5

The 3D Model Conversion Tool for OGRE System

Jiayu Liu[1] and Liang Han[2]

1School of Automation Science and Electrical Engineering, Beihang University,China

Abstract. 3D model is a main element of 3D scene; however, different kinds of modeling software typically create different file formats of 3D models. OGRE is a mature open source real-time 3D graphics library which only supports its owned mesh file format. In order to convert different 3D files to OGRE mesh and fully use model files in OGRE-based virtual system, a 3D model conversion tool is developed. Several 3D file formats have been taken analysis in their organizing structure and methods to convert them to OGRE mesh have been introduced.

MoA14-6

Real-time Rendering and Animating of Grass

Feng Li[1], Ying Ding[1], and Jin Yan[1]
1Aviation Key Laboratory for Advanced Simulation Technology,
School of Automation Science and Electrical Engineering, Beihang University.
China
Abstract. Real-time rendering of grass scenes is challenging for the geometric complexity and great volume of data. In this paper, a combination approach of geometry-based, volume slice-based and image-based techniques for grass rendering is proposed. Different levels of detail (LOD) are sequentially applied depending on the distance between models and camera. Seamless transition between two levels of detail is attained by hybrid models and fade-out method. Grass distribution is managed by density and height map based on geographic information system (GIS) data. In this method, it is possible to effectively conduct the simulation of large-scale grass scenes in real-time. The movement of grass with the wind is considered as a single degree of freedom (SDOF) vibration system. We realize the grass animation with shader in real-time and obtain acceptable results.

MoA14-7

Study on the Method of Assembly Sequence Evaluation Oriented to Virtual Assembly

Xinghui Dong[1], Yuanyuan Li[1], Xue Tian[1], and Yuwei Zhao[1]
1School of Energy, Power and Mechanical Engineering; North China Electric Power University; Beijing; China
Abstract. Assembly sequence planning is the important content of virtual assembly. In order to get the best sequence, an integrated evaluation of assembly sequence is suggested. The method proposes six evaluation factors, which include feasibility of assembly position、assembly stability、assembly reorientation、degree of assembly clustering、assembly precision and assembly time etc. It gives every corresponding evaluation methods of these factors, and power weight which is built by rank analysis method shows that different evaluation factor has different contribution to the integrated evaluation. Finally, we get the best assembly sequence by integrated evaluation method.

MoA14-8

Phased Array Antenna Design Based on Kriging Meta-model

Yajun Yang[1], Ying Liao[1], and Xingxing He[1]
1National University of Defense Technology,College of Astronautics and Material Engineering,China
Abstract. The traditional reverse design of the array antenna usually depends on the designer's personal experience and a large number of complicated iterative calculations, then needs to consume a lot of time throughout the design process. To solve this problem, a new method of array antenna design by using the experimental design method and approximate surrogate model is proposed. After establishing the antenna field strength model, performance indexes calculation and the Kriging meta- model, a design example of guidance radar is solved. And the result of the example verifies that this method can significantly reduce the amount of simulation, have obvious advantages especially in the case of a large number of array elements, and its design results are reliable.

MoA14-9

Pseudo-coloring Occlusion Culling

Jin Yan[1] and Guanghong Gong[1]
1School of Automation Science and Electronic Engineering, Beihang University, China
Abstract. A novel algorithm called Pseudo-Coloring Occlusion Culling (PCOC) approach was proposed for complicated models and integrated with an open source 3D graphics engine. In the PCOC, a complicated model was tessellated to a simplified model and the simplified model was rendered to a texture with pseudo-colors in real-time. Then, according to the pseudo-coloring texture, the visibility parts of the complicated model were determined automatically. In this paper, the efficient real-time pseudo-coloring method was applied in an automobile display system. The result indicated that the pseudo-coloring algorithm reduced 45% invisible triangles, increased 63% of frame rate and improved the performance of real-time rendering.

MoA14-10

A DSM-based Decision Modelling Approach for Combat System Effectiveness Simulation

Xiaobo Li1,2, Yonglin Lei1, Weiping Wang1, Qun Li1, and Hans Vangheluwe2
1 Department of Systems Engineering, National University of Defense Technology, Changsha, P.R.China,
2 Department of Mathematics and Computer Science, University of Antwerp, Antwerp, Belgium, 2020
Abstract: Combat system effectiveness simulation (CoSES) is of critical importance for combat system design, development and training, which involves modelling both the physical aspect (i.e. physics modelling) and intelligent aspect (i.e., decision modelling) of combat systems. Decision modelling is a tough issue in CoSES, since it belongs to the cognitive domain which concentrates on logical reference rather than physical mechanisms, and needs to cope with the evolution of tactics and to be integrated into the whole combat simulation system. In this paper we propose a decision modelling approach to develop friendly modelling environments and code generation mechanisms based on domain specific modelling (DSM), an innovative software modelling paradigm. This approach designs a domain specific modelling language (DSML) for decision modelling to raise the abstraction level and implements the semantics of the DSML based on a Python scripts framework, which

incorporates the decision model into the whole simulation system.

MoB2
15:50-18:10
Room2
Topic: Computing and Simulation applications in management, society and economics

MoB2-1
Modeling and Simulation on Information Spreading Based on Networks of Mobile phone
Fang Zhang[1,2], Guangya Si[1], and Pi Luo[1]
[1] National Defense University, No.3(A), Hongshankou, Haidian District, Beijing, China
[2] Sergeant School of the Second Artillery Engineering University, No.12, Fangongting South Street, Qingzhou China
Abstract. It is an advancing subject to research information communication by modeling and simulation and then to research the correlation of information propagation oriented at war gaming such as public opinion and rumor etc, which possesses important theoretical and practical values. The paper summarizes the current research and appliction state of modeling and simulation in the field of information spreading, points out the existing difficult problems in our study, and introduces the methods and key technology of modeling and simulation.

MoB2-2
An Agent-Based Artificial Transportation System Framework for H1N1 Transmission Simulation
Zilong Cheng[1], Xiaogang Qiu[1], Peng Zhang[1], and Rongqing Meng[1]
1School of Mechatronics Engineering and Automation, National University of Defense Technology, Changsha ,China
Abstract. Transportation system has significant impacts on society for its tight connection with travelling behaviors. Constructing an artificial society to study complex social behaviors is a novel approach which has been widely recognised as a key issue in recent years. In this paper we propose an agent-based ATS framework for H1N1 transmission simulation after reviewing the existing approaches. Mathematic models of H1N1 transmission are established to support and simulate individual's micro-decision-making mechanisms. After analyzing the diffusion mechanism of H1N1, an ATS framework which contains four modules is built up based on ACP theory. The four components including the initial agent module, environment agent module, individual agent module and interaction agent module are illustrated in detail. The design schemes of the framework are summed up based on system modeling theory followed by the computation flow based on SIR diffusion model. At last, further research directions of ATS are pointed out.

MoB2-3
Publishing Three-Dimensional City Models on the Web
Kenta Sato[1], Hiroyuki Yamamura[1], Akihiro Tsukamoto[2], Yuzuru Isoda[3], Susumu Nakata[4] and Satoshi Tanaka[4],
1Graduate School of Science and Engineering, Ritsumeikan University, Japan
2Kinugasa Research Organization, Ritsumeikan University, Japan
3Graduate School of Science, Tohoku University, Japan
4College of Information Science and Engineering, Ritsumeikan University, Japan
Abstract. In this paper, we propose a method of Web publishing of three-dimensional city models generated from two-dimensional geographical data. In our approach, the city models are assumed to be historical ones. For an example, rows of houses of Kyoto of the Edo era are generated by determining the areas of the houses based on geographical data and by placing and three-dimensional house models correspondingly. We employed Google Earth as the viewer of the city models. The viewer is embedded into a web page which enables users to access the page to overview the city and look into buildings. Some important documents related to the buildings are also embedded. As an alternative use, we apply the method to generation of city models of tsunami-damaged area in Tohoku district, Japan. The model generation is based on the recovery plan and models are generated by taking changes of terrain in the area into account.

MoB2-4
Modeling Social Opinion in Online Society
Mingzhi Zhang and Xiaofeng Hu
National Defense University of China, Beijing 100091, PRC
Abstract. social networks Online provide a globally available, largescale infrastructure for people to exchange information and ideas. A topic of great interest in internet research is how to model this information exchange and, in particular, how to model and analyze the effects of interpersonal in°uence on processes such as information diffusion, in°uence propagation, and opinion formation. Recent empirical studies indicate that, in order to accurately model communication in online social networks, it is important to consider not just relationships between individuals, but also the frequency with which these individuals interact. We study a model of opinion formation in social networks proposed by De Groot and Lehrer and show how this model can be extended to include interaction frequency. We prove that, for the purposes of analysis and design, the opinion formation process with probabilistic interactions can be accurately approximated by a deterministic system where edge weights are adjusted for the probability of interaction. We also present simulations that illustrate the effects of different interaction frequencies
on the opinion dynamics using real-world social

network graphs.

MoB2-5

Research on Risk Management Technology of Complex Products SBA Life-Cycle

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Abstract: SBA of complex products is a system engineering, which includes collaboration of personnel/organization, management and technology. All the activities involved in equipment system and the life-cycle require the support of comprehensive management. Research on management of SBA life-cycle is introduced in this paper. An evaluation indicator system is given with the analysis of SBA risk. Based on cost breakdown structure (CBS), a method of cost estimation is proposed. Moreover, a schedule prediction method using arrow diagramming method (ADM) and Monte-Carlo simulation is provided. Finally, with the application on SBA of one aircraft, the methods proposed in this paper are demonstrated.

MoB2-6

Development of System of Knowledge Base for Spherical Plain Bearing

Xuejin Shen[1], Deguo Li[1] , Shuai Lv[1] , and Yunfei Liu[1],
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Abstract. Presently, applying the Knowledge Base System in manufacturing industry bcomes a tendency. The paper brings the concepts of Knowledge Base System to the industry of spherical plain bearing, and establishes the Knowledge Base System of Spherical Plain Bearing. This system contains four parts of knowledge, i.e., data knowledge, literature knowledge, check knowledge and simulation knowledge. There are four main modules, including the module of data search, module of search and read of literature, module of check calculation and module of finite element analysis. The composition of system structure and flow of system design process are also introduced in this paper. This system is developed on Browser/Server structure. The Knowledge Base System of Spherical Plain Bearing takes the Visual Studio for the man-machine interface, selects the SQL Server 2008 for the storage of knowledge data, and realizes the integration with finite element software of Abaqus to make the analysis of mechanical properties for spherical plain bearing which could provide the basis for its further optimization design. This system is valuable and significant, and will play an important role in the informational construction of spherical plain bearing.

MoB2-7

Using Software Product Line Engineering for Magnitude Modelling and Simulation

Bin Tan, Jun Zhao, Jian-guo Wang, and Litie Tang
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Abstract. Magnitude of space object is an important parameter to the analysis of photoelectricity detection. Multiple, similar software products instead of just a single individual product are needed to be developed in the exploration of such problem. The magnitude modeling problem is given and the Software Product Line Engineering (SPLE) method is introduced to solve the problem. A feature model for magnitude modeling is given, and a variable architecture based on Satellite Tool Kit (STK) is designed. With this approach, exploration analysis of magnitude to photoelectricity detection could be set out.

MoB2-8

Architecture of Hybrid Cloud for Manufacturing Enterprise

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2.Engineering Research Center of Complex Product AdvancedManufacturing Systems, Ministry of Education, Beihang University,Beijing, 100191, P.R., China

Abstract. Cloud manufacturing (CMfg) provides a high-efficiency model to realize manufacturing resources sharing and on-demand using. Though private cloud service platform which has advantages of safety and efficiency is applicable for group enterprise, there is limit of network isolated. In order to increase profits and reduce costs simultaneously, some manufacturing enterprises will combine their private cloud service platforms with public cloud platform to release excess manufacturing resources and abilitiesand obtain more services. After analyzing the architecture of cloud manufacturing service platform, a hybrid cloud infrastructure applied for manufacturing enterprises is proposed, and some functional features of the hybrid cloud platform are described. Furthermore, a mechanism for private cloud combining with public cloud is presented. Finally, some challenges that enterprise might face while operating in hybrid cloud environment are discussed.

MoB2-9

A Study of Fault Detection and Diagnosis for PLC Controlled Manufacturing System

Shiming Qin [1] , and Ginam Wang[1]
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Abstract. Operational faults detect and diagnose to maintenance personals is a difficult thing. In PLC controlled flexible manufacturing systems, there is no inherent automatic fault finding module in controller itself, so additional diagnostic

module needs to be develop. Developed fault finding and diagnostic modules depending on measured data from the inspection machines and sensor data. In this work, a fault detection and diagnostic module is described based on internal PLC program signal data which is acquired through OPC Server. The observed or real-time PLC signal data is compared with normal PLC signal data to find out possible faults or deviations. The data acquisition procedure and the techniques used have been explained in this paper.

MoB2-10

Understanding And Modelling Vicious Circles

Chenggang Yin1, Alison McKay1, Shauna Coyle2 and Chris Clegg2
1School of Mechanical Engineering, University of Leeds, Leeds, UK
2Leeds University Business School, University of Leeds, Leeds, UK

Abstract. Time and cost overruns in the development and delivery of large complex engineering projects are often attributed to low quality communication and information through the development process when key decisions are made but relatively little is known about the final product. The problem is exacerbated by so-called “vicious circles” that are typical of industrial product development processes. Agent-based simulation is an emerging approach that can be applied to complex systems, such as product development systems, whose behavior is governed by actions of and interactions between autonomous agents. This paper reports an application of agent-based simulation to time-related aspects of a case study based on current product development practices in a multinational engineering organization. Early results are promising in moving towards our goal of management tools that support the identification of interventions to reduce time and cost overruns in the development and delivery of large complex products and services.

MoB1-a
13:30-15:30
Room3
Topic: Computing and Simulation applications in science and engineering

MoB1-a-1

Theoretical Study and 3D CFD Simulation of Temperature Distribution through HTST for Orange Juice

Yi Tang[1], Jing Xie[1], Jinfeng Wang[1], Zheng Zhang[1] , Chaoheng Gu[1]
1College of food science and technology, Shanghai Engineering Research Center of aquatic-Product Processing & Preservation, Shanghai Ocean University, China

Abstract. Heat sterilization has a long history. However, due to lacking of precise research, the sterilization relies mainly on experience, which leads to uncompleted sterilization or energy wastage. Computational fluid dynamics (CFD) is a tool to study the flow and heat transfer properties of different kinds of fluid. With the development of computer science and the improvement of CFD itself, CFD has been widely used in the industrial engineering. In this work, the CFD is used to study variation of the central temperature of an orange juice model under the HTST sterilization. Compared with the experiment results, the current simulation method is optimized and the error is reduced.

MoB1-a-2

Fuzzy Control Strategy for Train Lateral Semi-Active Suspension Based on Particle Swarm Optimization

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[2] School of Mechanical Engineering,Southwest Jiaotong University,Chengdu,China

Abstract. Fuzzy control strategy based on PSO was proposed for the complex train lateral suspension model. In this thesis, A17-DOF train lateral semi-active suspension system was modeled by simulink software, and at the same time, fuzzy controller and control rules were designed. Then, the root mean square value (RMS) of train lateral acceleration was used as object function, and membership functions of fuzzy controller’s output variable were designed by PSO. The result of the simulation reveals that compared with the traditional fuzzy controller, the values of train lateral acceleration RMS of the front and rear bogies by using the optimized fuzzy controller reduce by 5.05% and 7.75%, respectively. In comparison with the passive suspension, the values reduce by 13.56% and 15.51%, respectively, which is more significant.

MoB1-a-3

Design and Implementation of a Mathematical Simulation Platform

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Abstract. Simulation platform plays an important role in modeling and simulation. Some simulation platforms have already been successfully applied in related fields. In this paper, we propose a structure of a mathematical simulation platform, which is designed for the design and analysis of control systems. Functional modules of the platform, including the design methods and implementation details, are thoroughly illustrated,. This simulation platform has advantages in 1) Simulation resources deployment. 2) Batch simulation with different model parameters. 3) Simulation results post-processing. 4) Simulation model version management. 5) Distributed deployment and nodes monitoring. 6) Generation of report document. Within these functions, the simulation platform may reduce costs and enhance efficiency in developing a simulation

application. Finally, an implementation of this structure is provided and an example of an application of this simulation platform is demonstrated as well.

MoB1-a-4

Numerical Simulation and Linear Active Disturbance Rejection Control of Unstable Heat Conduction Systems

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1College of Information Science and Technology, Beijing University of Chemical Technology, China

2State Key Lab of Power Systems, Department of Thermal Engineering, Tsinghua University, China

3College of science, Beijing University of Chemical Technology, China

Abstract. This paper presents a numerical solution to one-dimensional unstable heat conduction systems with three different boundary conditions, e.g., a thin rod with heat conduction only in the length direction. A finite difference method combined with a physically feasible and high-precision boundary realization approach is employed to calculate the temperature values along the rod under Dirichlet, Neumann, and Robin boundary conditions, respectively. Using the temperature at a desired position, a simple and excellent robustness controller — — linear active disturbance rejection control (LADRC) could give an effective actuation on one boundary to get the temperature on the desired position under close-loop control. Finally, the robustness of the proposed controller with respect to external noises and parameter perturbations is also tested.

MoB1-a-5

Output Power Analysis and Simulations of Resonant Tunneling Diode based Oscillators

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Abstract. Negative differential resistance (NDR) devices such as Esaki tunnel diodes (TD), Gunn diodes and resonant tunneling diodes (RTD) are excellent in the realization of high frequency oscillators. However, for tunnel diodes and RTDs, which have large negative differential conductance, the output power tends to be low due to the DC instability, parasitic oscillations and the small area devices employed. In this paper, the maximum device areas for different NDR oscillator topologies, such as waveguide topology and planar topology, were calculated. The result shows that NDR devices for planar oscillators can be much larger (ranging from 3 to 1600 times) than those could be used in waveguide oscillators. A derivation of the maximum RF output power of a parallel RTD oscillator circuit is given and the simulations show that ~1 mW output power could be achieved at 800 GHz for a single diode oscillator.

MoB1-a-6

An Approach for Vehicle State Estimation Using Extended Kalman Filter

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Abstract. In order to meet the high cost requirement of some vehicle states measured directly in vehicle active safety control system, an approach using the Extended Kalman Filter to estimate lateral and longitudinal velocity is proposed. Firstly, a vehicle dynamic model with 3 DOF, including longitudinal, lateral and yaw motions is built with MATLAB/SIMULINK. Secondly, the vehicle state estimation algorithm by the extended Kalman state observer based on the nonlinear vehicle model is achieved and the states of longitudinal, lateral acceleration and yaw rate for the vehicle are estimated online. Finally, the estimated results are compared with the results obtained from CarSim using the same parameter to verify the practicality of the proposed method.

MoB1-a-7

Equilibrium Simulation of Power Market with Wind Power Based on CVaR Approach

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1Key Laboratory of Power Station Automation Technology, Department of Automation, Shanghai University, China

Abstract. High wind power penetration in power systems will significantly increase risks faced by the conventional generators in the deregulated electricity markets. This will further affect these generators' risk preferences and strategic behaviors. Based on conditional value at risk (CVaR), an equilibrium model of electricity market with wind power is developed taking into account the conventional generators' risk preferences. The model is performed by Monte Carlo simulation and nonlinear complementary method. The impacts of wind power volatility and generators' risk preferences on generators' strategy behaviors and equilibrium results are analyzed and the efficient frontier of generators' expected profit – CVaR is provided. The simulation results show that, the equilibrium market price will increase with the increase of wind power uncertainty; the increase of conventional generators' risk aversion will also lead to an increase in the expected market price; if generators collude with others, they will be more conservative.

MoB1-a-8

A Modified Endocrine Regulation Immune Algorithm for Job Shop under Uncertainty

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Abstract. There are many uncertain factors in

actual production environment, and should be considered during the study of job shop scheduling problems. In this study, the fuzzy scheduling mathematical model of job shop problems with uncertain processing time has been established based on fuzzy cut-set theory. The imprecise processing time is expressed with the triangle fuzzy variable and the fuzzy model can be transformed into the optimal model and the worst model according to the characteristic of scheduling problems. Furthermore, a novel modified endocrine regulation immune algorithm (MERIA) is proposed based on the regulation laws of hormone in the endocrine system. The mutual modulation between the endocrine system and the immune system can accelerate the evolutionary procedure of antibodies. In addition, the strategy of Overall Renewal is raised to update the antibodies of memory pool in each generation, which can improve the convergence of the novel algorithm. Finally, the effectiveness and efficiency of the fuzzy scheduling model and the proposed algorithm are demonstrated by comparative simulation results.

MoB1-b
15:50-18:10
Room3
Topic: Computing and Simulation applications in science and engineering

MoB1-b-1
High-Accuracy Magnetic Rotary Encoder
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2School of Electrical Engineering and Automation, Harbin Institute of Technology, China
3Shanghai RENLE Science & Technology Co., Ltd, Shanghai, China,
Abstract. A high accuracy magnetic rotary encoder for the speed sampling is designed, including both the hardware structure and the magnetic field analysis. For improving the magnetic field distribution of a magnetic encoder and lower the harmonic of output signals, the hardware structure with the magnetic collector is proposed. Aiming at decreasing the output deviation of the magnetic encoder, the signal correction algorithm based on the least squares estimation is put forward. In order to achieve an accurate measurement of a rotor velocity and a position, the signal decoding algorithm based on the closed-loop position tracking system is designed. The simulation and experiment results are provided to demonstrate the effectiveness and practicability of the proposed method.

MoB1-b-2
An adaptive Slope Compensation Circuit and Its Application
Chen Guanghua[1], Wang Fengjiao[1],Wu Changqian[1], Qin Long[1], Ma Shiwei[1] and Zeng Weimin[1]
1School of Mechatronics Engineering and Automation, Shanghai University, China
Abstract. To solve the over-compensation problem in the current mode PWM switch power, a new adaptive slope compensation circuit is proposed in this paper. In the circuit, the difference between the output and input voltage is positively correlated with the duty cycle of switch signal, which is used to generate the control signal varying with the duty ratio. The control signal is used to control the gate voltage of MOS operating in linear region, which changes the linear drain-source resistance. With clamping circuit, a proportional ramp voltage with controllable slope is produced and amplified for compensation system by two stage amplifier. This compensation voltage is almost ideal, which can reduce the negative effect of over-compensation farthest. This circuit is applied to an LED driver IC and simulated in Cadence with CSMC 0.5um BiCMOS library. The results show that the boost driver circuit using adaptive compensation has about 28% dynamic response time reducing compared with the settled slope compensation. Therefore, the proposed compensation circuit can improve system's dynamic responsibility effectively.

MoB1-b-3
The Structure Optimization of Spherical Plain Bearings Based on Taguchi Method
Xuejin Shen[1], Yunfei Liu[1], Yufeng Huang[1], Deguo Li[1],
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Shanghai University, China
Abstract. The self-lubricating spherical plain bearings is one type of sliding bearings, and it is widely used in the modern industry area. The structural optimization and design about it is complicated. The taguchi method based on orthogonal experiment is a steady design method in engineering, and it is used for structural size determination of self-lubricating spherical plain bearings in selected range for parameters matching. Many optimum proposals are formed, and the optimization goals are the maximum value of contact pressure and the maximum Mises stress difference value of the inner ring and the outer ring. Then, the error component is used to simulate the fluctuation of optimization goals. Two sets of signal-to-noise values are worked out. The final prioritization scheme is determined by computing the multiple SN values, and a new idea is provided to solve the similar problems.

MoB1-b-4
Research on Weight Functions of Electromagnetic Flowmeter in Open Channels
Shiyi Yin [1], Bin Li[1],
1School of Mechatronics Engineering and Automation, Shanghai University, China
Abstract. Starting with the basic principles of the weight function related with the electromagnetic flowmeter(EMF), the modeling and the theoretical analysis of the weight function in open channels

are proposed, and three main respects which affect the weight function of the EMF in open channels, including the model of the electrodes, the flow liquid level and the shapes of cross sections, are emphasized employing the finite element simulation technology. The distribution characteristics and the statistical properties of the weight function are studied and the conclusions are given, which fill the blanks in the field of the basic research on the weight function in open channels.

MoB1-b-5

Engineering Modeling and Simulation for New Estimation of Aircraft's Dynamic Angles

Zhao Wu[1] and Lixin Wang[1]

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Abstract. The measurement of aircraft's dynamic angles is difficult and inaccurate due to the precarious flight environment. This paper brings forward and amends a new estimation of aircraft's angle of attack and sideslip angle based on the basic of INS/GPS data. Through engineering modeling of closed-loop flight simulation framework and estimation method, the result shows obvious rationality and veracity.

MoB1-b-6

Trajectory Tracking Controller of Small-Scale Helicopter Based on Backstepping

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1College of Mechatronics and Automation,National University of Defense Technology, Changsha,China

Abstract. This paper presents a backstepping control design procedure for a small-scale helicopter. The objective is to control the small-scale helicopter to realize the autonomous tracking of the predefined trajectory which consists of the position and the yaw angle. The controller is derived based on Lyapunov stability theory. An approximate helicopter model is adopted and the flapping dynamic of the main rotor is considered. The main idea is to decouple the translational dynamics and the rotational dynamics through solving an equation when the desired yaw angle is predefined. Simulation results show that the performance of the proposed controller is acceptable.

MoB1-b-7

Study on General Effectiveness Evaluation Platform for Combat Aircraft

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1School of Astronautics Beijing University of Aeronautics and Astronautics, China

2School of Automation Science and Electrical Engineering,Beijing University of Aeronautics and Astronautics, China

Abstract. The analysis of combat simulation system effectiveness is achieved by synthesizing reasonable indicators that based on demands of evaluation. To meet increasing requirements for evaluation, this paper designs and develops an Effectiveness Evaluation Platform for Combat Simulation System (EEPCSS), which can serve different combat simulations. EEPCSS obtains its generality by many methods, such as constructing the specification of evaluation models, providing typical evaluation models with universal interfaces for various combat simulation systems, building the index systems automatically, analyzing of test data, recording and replaying of evaluation process, synthesizing of indexes, and generation of evaluation results. As an application instance, EEPCSS is conducted to evaluate the performance of aircrafts in combat simulation. The evaluation result proves that EEPCSS can work effectively in solving practical problems.

MoB1-b-8

Fuzzy Sliding Mode Variable Structure Controller for Hypersonic Cruise Vehicle

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1Science and Technology on Aircraft Control Laboratory,Beihang University,China

Abstract. For airbreathing hypersonic vehicle,the hypersonic cruise conditions with strong nonlinearity, parameter uncertainties, the higher requirement of control accuracy characteristics, to establish a control oriented model, and by using Lyapunov method were designed with different time scale of double loop control system. In order to solve the chattering problem of sliding mode control, this paper integrates fuzzy control with the idea of sliding mode variable structure control, and had researched the fuzzy sliding mode variable structure controller design method. This method can not only guarantee the system stability, but also restrain chattering. In the MATLAB for the control system of simulation test, the feasibility of the method is demonstrated.

MoB1-b-9

Grid Current Control Strategy Based on Internal Model Control and Repetitive Control

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Abstract. In this paper, a new grid current control strategy based on internal model control and repetitive control is designed. The performance characteristic and operation principle are analyzed according to the basic principle of internal model control and the dynamic mathematical model of three-phase photovoltaic grid-connected inverters. Because the harmonic current caused by the dead-time effect and the periodic disturbance of the grid can not be eliminated by internal model control, a composite control strategy with internal model control and repetitive control is proposed in the paper. Internal model control can simplify the controller's parameters and ensure the dynamic quality of the system. Repetitive control is able to restrain the

dead-time effect and the periodic disturbance of the grid. It can also reduce the total harmonic distortion of the grid-connected current. The simulation results show that the proposed control strategy has good dynamic and steady-state performance and can restrain the periodic disturbance as well.

MoB1-b-10

Structural analysis of high-index DAE for process simulation

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Abstract. This paper deals with the structural analysis problem of dynamic lumped process high-index DAE models.We consider two methods for index reduction of such models by di®erentiation: Pryce's method and the symbolic di®erential elimination algorithm rifsimp. Discussion and comparison of these methods are given via a class of fundamental process simulation examples. In particular, the exciency of the Pryce method is illustrated as a function of the number of tanks in process design.

MoB1-c
13:30-15:30
Room4
Topic: Computing and Simulation applications in science and engineering

MoB1-c-1

An Analytical Design Method for the Missile Two-loop Acceleration Autopilot

Hui Wang[1,2], De-fu Lin[2], Jia-xin Wang[2], and Tao Song[2]
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2. School of Aerospace Engineering, Beijing Institute of Technology, China

Abstract. According to the missile longitudinal dynamics expressed as the state space matrix form and the defined dynamics coefficient notations, the missile body transfer functions are deduced in detail. Using the thought of pole allocation, a detailed analytical methodology for designing the two-loop acceleration autopilot has been proposed. To get the exact gain crossover frequency of the autopilot, an unconstraint optimization problem is outlined. The design and simulation results show that the two-loop acceleration autopilot can stabilize the missiles with different static margins very well.

MoB1-c-2

Study on Holon Environment Model in Battle Deduction Simulation System

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2National Key Laboratory of Underwater Information Process and Control, Xi'an, China

Abstract. The battle deduction simulation system is usually designed as MAS (Multi-Agent System). Environment modeling is considered as the most important process in constructing a MAS. The MRM (Multi-Resolution Modeling) technique is used to build the simulation entity models. In order to construct environment model with multi-resolution in the battle deduction simulation system, a classification of battlefield environment is proposed and a battlefield environment modeling method based on the concept of Holon is put forward. This method uses the cooperation of Holon to make environment model form a dynamic hierarchical structure, which has the characteristics of multi-resolution. This environment model is able to offer environmental information with corresponding resolution for the multi-resolution entity model in the battle deduction simulation system.

MoB1-c-3

Improved Virtual Leader Based Formation Control for Nonholonomic Multi-UUV

Lili Hao[1, 2], Hao Gu[1], Fengju Kang [1, 2], Huizhen Yang[1, 2], and Xiaolong Yang [1, 2]
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Abstract. In older to solve the potential singularity problem brought from the polar coordinate representation, and eliminate the offset caused by off-axis point in the feedback linearization formation control approach, a novel improved virtual leader based formation control for nonholonomic multi-UUV is proposed, the kinematics model of which is established using Cartesian coordinates. Then, the global-level formation control is transformed into the problem that the followers track their virtual leader. Next, a globally dynamic feedback tracking controller is designed based on the direct Lyapunov method. Finally, simulation results are given to demonstrate that the proposed model and controller are feasible.

MoB1-c-4

An Image Processing Method for Grains Counting

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Abstract. In the process of quality analysis of grains, number counting is one of the key steps for agricultural production. After the introduction of the traditional counting

methods, an approach based on computer version and image processing technique is proposed in this paper. The overall structure including hardware and software of system is introduced firstly. Then, the image processing methods are described in details, which are mainly composed of gray transformation, denoising, binary conversion, mathematical morphology analysis, et al.. Finally, an experiment is conducted to test the validity of the algorithm, and the result shows that this method is effective and can realize the automatic grain counting.

MoB1-c-5

Design and Realization of Vision-Based Landing Simulation Verification System for UH Based on Vega Prime/MFC

Zhijia Sui [1,2], Yongmei Cheng [1], Tao Wang [2], Ruonan Kong [1,2], and Yazhou Yue [2]
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2. Science and Technology on Aircraft Control Laboratory, Flight Automatic Control Research Institute, Xi'an China

Abstract. In order to reduce the number of flight test of the visual landing navigation verification system, reduce the cost of research and shorten the development cycle, the visualization simulation system based on virtual reality technology is demanded. An vision-based landing simulation verification system for UH based on Vega Prime / MFC was put forward. Firstly, the overall framework of the system was designed and the interaction among modules was introduced. Then a detailed description of each module function was given, and explanation of the cooperation target detection and UH position and orientation parameters were further carried out. Finally, a MFC-based Vega Prime view of the driver to achieve visualization of vision-based landing simulation verification system was developed. The simulation results show that the system can effectively unfold the cooperation target detection and UH position and orientation solving process in an intuitive, continuous and real-time pattern, and realize the simulation-testing function. It provides a good simulation platform for practical engineering applications.

MoB1-c-6

Design and Experiment of Adaptive Active Vibration Control System for Aircraft Framework

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School of Mechatronics Engineering and Automation, Shanghai University, China

Abstract. Hypersonic aircraft with a high velocity and super maneuverability has become a hot spot in current research of near space aircraft. To suppress the aircraft's vibration during its running process, an active vibration control system for aircraft framework is designed in this paper based on the adaptive filtering algorithm. To start with, an adaptive filtering algorithm – filter-x least mean square (FXLMS) algorithm is presented. Then the hardware configuration and software development are introduced in detail. Meanwhile, the piezoelectric smart structure is used for detecting and driving. The measurement and control system designed in this experiment has 8 input channels and 8 output channels which are able to process off-line identification, on-line identification and real-time control. By choosing reasonable parameters and distributing channels logically, an adaptive active vibration control is imposed. Finally, the experimental performance verifies the feasibility of FXLMS algorithm and the validity of the designed control system.

MoB1-c-7

Model Reconstruction Using B-Spline Surfaces

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3Interlocus,Inc. Kanagawa, Japan
4Department of Mechanical Sciences and Engineering Graduate School of Science and EngineeringTokyo Institute of Technology Tokyo, Japan

Abstract. Recently, some results of the G^1 continuity conditions for B-splines surfaces have been presented. These G^1 conditions can be used in the reconstruction of bicubic and biquintic smooth B-splines surfaces with a single interior knots. However, the C^1 continuity conditions of B-spline surfaces with arbitrary degrees have not been solved. In this paper, we obtain the C^1 continuity conditions between two adjacent B-spline surfaces with arbitrary degrees. We also present a practical scheme of reconstructing model using the C^1 continuity conditions in reverse engineering.

MoB1-c-8

Consideration of Origami Design Clothing

Eri Nakayama1,Sachiko Ishida1, Liao Yujing,1Ichiro Hagiwara1
1Organization for the Strategic Coordination of Research and Intellectual Property, Meiji University, Japan

Abstract. Several Applications of Origami have been tested in industrial areas, however, in design area, Origami design is found only in lamp shade and wrapping. In clothing Origami design hasn't been practically applied before. In this paper, a conical Truss model is introduced as an application of skirt designs, and the simulation software from 2D to 3D is considered. Later the measurement of brain wave is conducted for observers who see the simulation screen, and by examining the correlation between each feature of clothing and brain wave α , we can detect the

most healing design for clothing.

MoB1-c-9

Speaker Identification Based On Sparse Representation

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Abstract Sparse representation, a new classification method for speaker identification has been proposed which assumed that all the training patterns of a particular class approximately form a linear basis for any test sample belonging to that class. The main idea based on this new approach is that an unknown test utterance can be represented as a linear combination of the training database while the training patterns are sufficient. The training database mentioned above is named over-complete dictionary which is developed by adapting GMM Supervectors to Gaussian Mixture Model-Universal Background Model (GMM-UBM) using Maximum-A-Posteriori (MAP) adaptation. ℓ1-norm minimization is then applied to obtain the coefficients of unknown test utterances corresponding to the class index of test models, and the task of speaker identification is eventually viewed as the problem of finding sparse solution. Experiments conducted on TIMIT Acoustic-Phonetic Continuous Speech Corpus showed that the performance of the proposed method consistently outperforms the state of art speaker identification classifiers.

MoB1-d
15:50-18:10
Room4
Topic: Computing and Simulation applications in science and engineering

MoB1-d-1

Comprehensive Optimization for Raised Floor Structure Using Origami Engineering

Yang Yang[1] , Zhizhen Xia[2], Xilu Zhao[3], Sunao Tokura[4], and Ichirou Hagiwara[1]
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Abstract. Multi-core panel is widely used in raised floor structure. However, it has the disadvantage of heavy weight. In this paper, the authors try to reduce the weight of the raised floor structure by replacing multi-core panel with truss core panel, which is a well-known lightweight structure using origami engineering. The intension and stiffness of truss core panel for raised floor model are investigated. The multi-core panel and the truss core panel are compared by running impact test and load test. Response Surface Method (RSM) is used to optimize the shape of truss core panel. The explicit FEM software LS-DYNA is used to solve impact-load analysis. The results show that 23.69% weight reduction is achieved for exiting multi-core panel of raised floor by using truss core panel.

MoB1-d-2

3D Origami Structure Design and Simulation by Parametric Origami Module

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[1]Institute for Advanced Study of Mathematical Science, Meiji University, Kanagawa, Japan
[2]Saitama Institute of Technology, Saitama, Japan

Abstract. The purpose of this paper is to propose a Parametric Origami Module and relevant methods, which are able to expand the complex three-dimensional origami structure into a plane only by the topological relation matrix TP and node position coordinate matrix GP. Furthermore, an extended data structure for POM is proposed as well. In this study, we are not limited to the particular conditions for design origami structure such as Ori-tatami folding and axial symmetry. Plenty of three-dimensional origami structures are analyzed from the geometrical perspective and the common features among them are extracted. In the end, we compare the proposed method with others in further discussion and confirm its effectiveness.

MoB1-d-3

A Number of Key Technologies in Ocean Wave Modeling and Simulation

Jianhua Xu1,2, Hao Gu1, Dinghua Wang 1,2, Fengju Kang1,2 and Huizhen Yang1,2,
1. Marine College of Northwestern Polytechnical University, Xi'an, China;
2. National Key Laboratory of Underwater Information Process and Control, Xi'an,

Abstract. Given the requirements for ocean wave three-dimensional visual simulation, and in combination with theory and engineering it expatiates, visualization key technologies such as ocean wave numerical simulation based on the modified linear dual superposition method, vertex array-based wave surface rendering method and light effect simulation into the details, and using DirectSound technology it achieves a sound simulation of the different sea conditions. The simulation results show that the ocean wave three-dimensional display is of high fidelity, good real-time and abundance sound, and thus is of great significance in ocean development and combat simulation.

MoB1-d-4

Simulation of Skip-Glide Trajectory for Hypersonic Vehicle in Near Space

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1Xi'an Research Institute of Hi-Tech Hongqing Town,China
2.Aircraft Design Institute GAIG, AnShun, China

Abstract. The periodic skip-glide trajectory models for hypersonic vehicle in near space were

brought out and simulated in this paper. Firstly, the basic concepts of hypersonic vehicle and different trajectory modes were introduced in detail. Then, the three degrees of freedom model of hypersonic vehicle was given. Lastly, the model was simulated and analyzed using MATLAB. The difference changing trend of periodic trajectory, velocity, effective range, trajectory obliquity and dynamic pressure are given. How the main factors such as trajectory obliquity, launch orientation affect the periodicity was also studied. The primary simulations show that the periodic trajectory of hypersonic vehicle helpful in studying new space vehicle.

MoB1-d-5

Current Trends and Issues of Origami Engineering

Ichiro Hagiwara[1]
1Organization for the Strategic Coordination of Research and Intellectual Property, Meiji University, JAPAN

Abstract. Japanese Origami craft is very beautiful, and the term “Origami” is translated into Origami in English. There have been many Origami creators appearing from Japan, however their craft work is not created on the basis of geometry but born from imagination they possess. As a result, only honeycomb is developed by British referring to star festival decoration of Japan. This situation is shameful for Japanese engineers. In this paper, many Origami crafts based on geometry are introduced. Taking these crafts into consideration, two facts are to be verified. One is that dire-core based on space filling geometry surpasses in some features than honeycomb, and the other is that judging from the fact plants grow up spirally, reverse spiral structure which has the same structure as them is superior as energy absorption member

MoB1-d-6

Design and Simulation for the Single Leg of the Six Degrees of Freedom Vibration Isolator

Yongliang Zhang[1], Baiwei Guo [1], and Xiuyun Meng[1]
1Key Laboratory of Dynamics and Control of Flight Vehicle, Ministry of Education
Beijing Institute of Technology, China

Abstract. With the development of space technologies, the optical payload requirement on the pointing accuracy becomes higher and higher. The active vibration isolation is an effective way to improve the pointing accuracy of the optical load, and the six freedoms Stewart Platform is widely adopted in the active vibration isolation for spacecrafts. The double-layer structure is adopted for the single leg of the Stewart Platform and the parameters of the passive part are optimized by the GA algorithm. For the active part, the L1 method is used for solving the problems in the vibration isolator because of the impact load. The simulation results indicate the effectiveness of the L1 method for solving the problem.

MoB1-d-7

Analysis and Implementation for the Algorithm Based on Combinatorial Relaxation for Computing the Structure Index of DAE

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[2]Graduate University of Chinese Academy of Sciences,Beijing, China

Abstract. As the society industrialized, mathematical modeling and simulation become increasingly important in the product design. At present, the multi-domain unified modeling with Modelica is a mainstream technology in the field of complex systems. Modeling of complex physical systems with Modelica often produces a high-index differential algebraic equation (DAE) system. It needs to be transformed to low-index DAE before solving it. The structure index reduction algorithm is one of the popular index reduction methods. But in some special circumstances, its solution may be incorrect. At present, combinatorial relaxation algorithm is a widely used method for solving the problem. Solving maximum weighted matching is one of important problems of the combinatorial relaxation algorithm. This paper describes the combinatorial relaxation algorithm and proposes three different implementations of Hungarian algorithm for the maximum weighted matching problem. The theory results are consistent with the experiment results,

MoB1-d-8

Design and Analysis of Missile Two-loop Autopilot with Angle of Attack Feedback

Jiang Wang[1], Zhe Yang[1] , and Defu Lin[1]

Abstract. In order to eliminate the static error of the classic two loop autopilot, the PI compensator is introduced into the control system. To enhance the robustness of two loop autopilot with PI compensator, an angle of attack feedback is introduced into the system. Using the method of pole-place, the controller parameters of different two loop autopilot topologies are deduced. The analytical results show that a well designed two-loop autopilot with PI compensator can introduce a zero in numerator which counteracts the first-order inertial loop in denominator. However, the two-loop autopilot with PI compensator and angle of attack feedback introduces the phase-lead compensation in the feedback-loop. The zero cannot cancel the first-order inertial loop in denominator, and it is dominated by the first-order inertial loop. This kind of autopilot topology has better robustness than others.

MoB1-d-9

Iterative Learning Control of Batch Processes Using Adaptive Differential Evolution Algorithm

Guohua Zhang[1], Kai Yuan[1], Li Jia[1]
1Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University, China

Abstract. Considering the potentials of iterative learning control as framework for industrial batch process control and optimization, an iterative learning control based on adaptive differential evolution algorithm is proposed in this paper. At first, quadratic criterion-iterative learning control with adaptive differential evolution algorithm is used to improve the performance of iterative learning control. In addition, the strategy of eliminating error using iterative algorithm is employed to drive the solution to the optimal point. As a result, the proposed method can avoid the problem of falling into local extreme points when solving the objective function with multiple local extreme points, which usually exists in traditional gradient-based iterative learning control. Lastly, example is used to illustrate the performance and applicability of the proposed method.

MoB1-d-10

Time-varying Neuro-fuzzy Model Using Probability Density Function Techniques for Batch Processes

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Abstract: A time-varying neuro-fuzzy model based on probability density function (PDF) technique is proposed in this paper. It is able to describe the characteristics of repetition of batch process by using the input-output data information of batch axes and time axes separately. More specifically, the parameters of time-varying neuro-fuzzy are functions of time during one batch while it can be looked as uniform values from the viewpoint of batch to batch. Moreover, it converts the modeling problem into a probability density function shape of modeling error control problem. The adjustable parameters of time-varying neuro-fuzzy model is updated to make the probability density function shape of modeling error to follow the targeted probability density function. As a result, the proposed method not only describes the characteristics of repetition of batch process but also guarantees the generalization and robustness, especially when uncertainty and disturbance exist. Lastly, to verify the effectiveness of the proposed identification method, it is applied to a benchmark batch process, in comparison with traditional identification algorithm based on minimum variance and zero mean.

MoB3-a
13:30-15:30
Room5
Topic: Computing and Simulation applications in energy and environment

MoB3-a-1

Modeling the Power Generation Dispatching in Cyber-Physical Interdependent Perspetive

Yi Xu1and Guangya Si1
1 National Defense University, Haidian District, Beijing, China

Abstract. Modeling of the modern electric power infrastructure (EPI) which is a typical Cyber-Physical System has been an important method to analyzing the possible vulnerabilities in it and promoting its security. A modeling and simulation method based on Multi-Agent System (MAS) is proposed. And the modeling of generation dispatching in cyber-physical interdependent perspective has been completed first. The simulation experiment using the data coming from a real power grid system shows that our system could model the electrical characteristic of the real system and the generation dispatching according to the changing loads in reason.

MoB3-a-2

An Intelligent Method for Fault Diagnosis in Photovoltaic Array

Zhihua Li[1], Yuanzhang Wang[1], Diqing Zhou[1], and Chunhua Wu[1]
1Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, Shanghai University, China

Abstract. A new intelligent method is proposed to detect faults in the photovoltaic (PV) array. Usually, there is an obvious temperature difference between the fault PV module and the normal PV module. So, the temperature information of the PV modules is utilized to locate the fault in the PV array firstly. Then, the Artificial Neural Network (ANN) is applied to diagnosis the type of the fault. The current of maximum power point (I_{mpp}), the voltage of maximum power point (V_{mpp}) and the temperature of the PV modules are input parameters of the ANN. The output of the ANNunit is the result of the fault detection. Basic tests have been carried out in the simulated environment under both normal and fault conditions. The simulation results show that the outputs of the ANN are almost consistent with the expected value. It can be verified that the proposed method based on ANN can not only find the location of the fault but also determine the type of the fault.

MoB3-a-3

Comparison of LOLE and EUE-Based Wind Power Capacity Credits by Probabilistic Production Simulation

Shaohua Zhang[1], Chen Zhao[1], and Xue Li[1]
1Key Laboratory of Power Station Automation Technology, Department of Automation, Shanghai University, China

Abstract. To mitigate the global climate change and environmental issues, wind power generation is growing at a startling pace around the world. The wind power capacity credit can be used to measure the contribution of wind power resource to the capacity adequacy of a power system, thus plays an important role in development of wind power resources and expansion planning of power systems. Using the probabilistic production simulation technology, wind power capacity

credits based on the capacity adequacy indexes LOLE and EUE are investigated and compared in this paper. The theoretical analysis and numerical simulation show that non-smoothness presents in variation of the LOLE index with load, while variation of the EUE index with load displays a good smoothness. This will lead to a difference in the EUE-based and the LOLE-based wind power capacity credits. In addition, the wind power capacity credits based on the LOLE index is non-monotonic for relatively small installed capacity of wind power.

MoB3-a-4

Modeling and High Performance Computing Analysis of Three-Dimensional Electromagnetic Environment

Yingnian Wu1,2, Lin Zhang1, Fei Tao1, Yuewei Shen1,Dengkun Liu1, and Lan Mu1
1School of Automation Science and Electrical Engineering, Beihang University,China,
2School of Automation, Beijing Information Science & Technology University,China

Abstract. Electromagnetic environment (EME) is important in both civil and military wireless communication systems design and radar testing. The key is on whether the EME model and algorithm is proper for the computer solution and how to make the algorithm actually work in computer or computer clusters. We have analyzed EME modeling by three-dimensional parabolic equation (3DPE) and discussed the finite difference method with it, then provide the idea of transforming the equation solving algorithms to parallel algorithms. The cloud computing simulation framework is given and discussed. The future work direction is shown in the conclusion.

MoB3-a-5

Modeling and Simulation of Electricity Markets under Different Environmental Policies

Xinhua Fu[1], Chen Zhao[1], Shaohua Zhang[1], and Xian Wang[1]
1Key Laboratory of Power Station Automation Technology, Department of Automation, Shanghai University, China

Abstract. Renewable energy quota obligation has been enforced in many countries to mitigate greenhouse gas emissions and promote renewable energy. To fulfill the quota obligations, many countries have adopted environmental policies such as carbon tax (CT) and feed-in tariff (FIT) in their electricity sectors. This paper aims to examine the impacts of different environmental policies on the electricity market competition and the social welfare. For this purpose, Cournot equilibrium models for electricity wholesale market competition are developed taking into account the CT and the FIT policies. The nonlinear complementarity approach is employed to solve these equilibrium problems. In addition, an environmental policy that combines the carbon tax and the feed-in tariff (CT&FIT) is also proposed in this paper. Numerical simulations are presented to assess the performances of different environmental policies. Some practically meaningful conclusions are derived.

MoB3-a-6

Overload Risk Assessment in Grid-Connected Induction Wind Power System

Xue Li[1], Xiong Zhang[1], Dajun Du[1], and Jia Cao[1]
1Department of Automation, Shanghai University, China

Abstract. Aiming at the new uncertainties brought by wind farms connected directly into power grid, a novel approach to calculate overload risk in grid-connected induction wind power system is proposed. In this method, the probability and consequence of line flow fluctuations is fully considered, and a probabilistic wind farm model is firstly presented. The probabilistic load flow (PLF) calculation with correlated parameters is then used to analyze the randomness of system statuses. Furthermore, the severity function is applied to describe the impact of line flow fluctuations. Finally, the overload risk index is quantified and is treated as an indicator of power system security. Simulation results of the modified 5-bus system confirm the effectiveness of the proposed method.

MoB3-a-7

Simulation Research on the Effect of Thermocline on Underwater Sound Propagation

Lin Zhang[1], Lianglong Da[1], and Guojun Xu[1]
1Navy Submarine Academy, Qingdao, China

Abstract. The thermocline has an important influence on sound propagation or underwater acoustic detection in shallow water. The beam-displacement ray-mode theory is used to analyze the effect of thermocline on underwater sound propagation. The peculiarity of this method is that the boundary effects on the sound field can be expressed by the equivalent boundary reflection coefficient. An improved new method for computing the upper boundary reflection coefficient in the theory is proposed based on the generalized phase integral eigen function and an univocal formulation of upper boundary reflection coefficient is deduced. An ocean environment model of thermocline is established. The effect of thermocline's depth, thickness and intensity on sound transmission loss is discussed. The research result shows that thermocline has an important effect on sound transmission loss. It is of practical guiding significance in sonar detection and underwater warfare.

MoB3-a-8

Study of Real-Time Wave Simulation in Virtual Battlefield Environment

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1School of Marine, Northwestern Polytechnical University, Xi'an,China;
2National Key Laboratory of Underwater Information Process and Control, Xi'an ,China
3Aeronautics & Astronautics Engineering College, Air Force Engineering University, Xi'an, China

Abstract. Aiming at the requirements for virtual naval battle environmental simulation, we present an ocean wave simulation method. Firstly according to double superposition model based on the ocean wave spectrum and the linear ocean wave theory, using the acceleration algorithm for ocean wave numerical simulation, the method completes the three-dimensional shape of ocean wave, and then introduces vertex array graphics rendering into drawing ocean wave. Lastly, to improve the visual fidelity, with separate specular color and local viewpoint, we achieve ocean wave surface reflected light effects simulation. Through testing and validation, the method can quickly simulate ocean waves, and the simulation result is available.

MoB3-a-9

Solving Spatial-Fractional Partial Di®erential Di®usion Equations by Spectral Method25

Ningming Nie12, Jianfei Huang2, Wenjia Wang3 and Yifa Tang2
1Supercomputing Center, Computer Network Information Center, Chinese Academy of Sciences,China
2LSEC, ICMSEC, Academy of Mathematics and Systems Science, Chinese Academy of Sciences,China
3Yuanpei College, Peking University, China

Abstract This paper focuses on numerical solution of an initial-boundary value problem of spatial-fractional partial di®erential di®usion equation (SFPDE). The proposed numerical method is based on Legendre spectral method for Riemann-Liouville fractional derivative in space and a ¯nite di®erence scheme in time. Numerical analysis of stability and convergence for our method is established rigourously. Finally, numerical results verify the validity of the theoretical analysis.

MoB3-b
15:50-18:10
Room5
Topic: Computing and Simulation applications in energy and environment

MoB3-b-1

Numerical Modeling for Venus Atmosphere Based on AFES (Atmospheric GCM for the Earth Simulation)

Norihiko Sugimoto[1], Masahiro Takagi[2], Yoshihisa Matsuda[3],
Yoshiyuki O.Takahashi[4], Masaki Ishiwatari[5], and Yoshi-Yuki Hayashi[4]
1Research and Education Center for Natural Sciences, Keio University, Yokohama, Japan
2Faculty of Science, Kyoto Sangyo University, Kyoto, Japan
3Department of Astronomy and Earth Science, Tokyo Gakugei University, Koganei, Japan
4Department of Earth and Planetary Sciences, Kobe University, Kobe, Japan
5Department of Cosmosciences, Hokkaido University, Sapporo, Japan

Abstract. In order to elucidatephenomena of Venus atmosphere,an atmospheric general circulation model (AGCM) for Venus is being developed on the basis of AFES (AGCM For the Earth Simulator). As a first step toward high resolution numerical simulation with realistic physical processes, we investigate unstable modes on the condition of super-rotation by nonlinear numerical simulation with simplified physical processes.At initial state zonal super-rotation is assumed to exist.We use the relaxation forcingof the meridional temperature gradientto maintain the zonal flow.In the time evolution of this experimental setting, baroclinic modes grow in the cloud layer with small static stability. The structures of unstable modes are similar to those obtained in the linear stability analysis. We discuss resolution dependency of the results.

MoB3-b-2

A Conservative Front-Tracking Method for Scalar Conservation Laws in One Space Dimension with Nonconvex Flux

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2Department of Mathematics, Shanghai University, Shanghai, 200444, China

Abstract. The second author of this paper has designed a conservative front-tracking method. The method tracks discontinuities by using the conservation property of the hyperbolic conservation laws rather than the Hugoniot condition. We compute the numerical solution on each side of a discontinuity using information only from the same side. In this paper, we develop the method for one-dimensional scalar conservation laws with nonconvex flux. Numerical examples are presented to show the robustness and accuracy of the method.

MoB3-b-3

A Retrieving Algorithm for Unfolded Sheet Metal Parts Based on the Features Relation

Dawei Wang [1]and Dongyun Ge[1]
1Beijing Aeronautical Science & Technology Research Institute (BASTR),
COMAC, Beijing, China

Abstract. This paper presents a new retrieval algorithm for unfolded sheet metal parts. The primary idea of this novel algorithm is based on the relative position relationships of features in sheet metal parts. After analyzing the data structure of sheet metal parts, some kinds of key features are abstracted and the relative position model is described to express the difference of features' relative position. Further, detailed information about the position model and the formula of similarity developed for difficult sheet metal parts is given and described. Also an example is given at the last of paper to verify the validity of our algorithm. Obviously, our new algorithm meets the requirements of searching unfolded sheet metal parts.

MoB3-b-4

Finite Difference Methods for Space Fractional Advection-Diffusion Equations with Variable Coefficients

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1 School of Mathematics and Computational Science, Xiangtan University, Hunan, China
2 LSEC, ICMSEC, Academy of Mathematics and System Sciences, Academia Sinica, Beijing ,China

Abstract. In this paper, the implicit difference scheme is presented to solve a class of space fractional advection-diffusion equations with variable coefficients. The stability and convergence of this method is discussed respectively. Finally, we give several numerical examples to confirm our theoretical analysis.

MoB3-b-5

Review of the Power Grid Model Vulnerability Based on Complex Network Theory

Zhiguo Ding[1,2]and Minrui Fei[1]
1School of Mechatronics Engineering and Automation, Shanghai University, China
2College of Mathematics, Physics and Information Engineering, Zhejiang Normal University, Zhejiang, China

Abstract. Topology structure of power grid has intrinsic and substantial characteristics which if once ascertained in the build of the power grid will have crucial impact on its performance. Therefore, in this paper, some network models commonly used in power grid are introduced and analyzed byreference of the domestic and overseasresearches which are based on the complex theory. There exist some key transmissionlines and/or vulnerable nodesin thepower grid,and if either of them breaksdown, itmay result in wide-area blackoutsand even the cascading failures. Since smart grid is the trend of the current power grid, cyber-physical network structure model as well as some current researches on smart grid has been introduced. At last, some thoughts about how to better develop smart gridare proposed.

MoB3-b-6

Extraction of Vortices and Exploration of the Ocean Data by Visualization System

Chi Zhang[1], Takashi Uenaka[1], Naohisa Sakamoto[1] and Koji Koyamada[1]
1Graduate School of Engineering, Kyoto University, Japan

Abstract. Naturally, fishery highly depends on the environment in the ocean. To increase fishing hauls, the analysis of the ocean is of great significance. In this paper, we proposed some visualization tools which help to filter and analyze the ocean data such as temperatures and currents velocities. Sea currents are visualized as streamlines and vortices can be detected and extracted. We constructed a system environment in which we can analyze the relationship between the vortices and the distribution of tempetures, which is visualized by volume rendering.

MoB3-b-7

Modeling and Simulation of Partial Shaded PV Modules

Zhou Diqing[1], Chunhua Wu[1], and Zhihua Li[1]
1Shanghai Key Laboratory of Power Station Automation Technology, Department of Automation, Shanghai University, China

Abstract. Partial shading instances are very common in photovoltaic (PV) systems. The mismatch losses and hot spot effects caused by partial shading can not only affect the output power of solar system, but also can bring security and reliability problems. A mathematical model reflecting the output electrical characteristics of the partial shading PV module is put forward in this paper. Compared with the traditional model, it is able to show the variation of the output electrical characteristics of the PV module by adjusting the irradiance, temperature and the area of partial shading. The model is used to analyze the power losses of the partial shaded PV model with different number of bypass diodes. The simulation results show that a PV model under partial shading with 6 bypass diodes is the best configuration to minimize the mismatch power loss. It has an important meaning for practical engineering application.

MoB3-b-8

Research on Run-Time Atmosphere Environment Database Based on Berkeley DB

Jinzhan Zhang[1], Guanghong Gong[1], Jiangyun Wang[1], and Dongdong Gao[1]
1Aviation Key Laboratory for Advanced Simulation Technology School of Automation Science and Electrical Engineering, Beihang University. China

Abstract. Synthetic Natural Environment is an important support for modern simulation systems. Atmosphere data is one special kind of SNE. To fulfill the performance requirements of atmosphere environment data storage and access during simulation, we need to build an efficient run-time atmosphere database. This paper mainly analyses the characteristics of atmosphere data and run-time atmosphere database, then introduces a famous embedded database Berkeley DB and analyses the feasibility of building run-time atmosphere database based on it.

MoB3-b-9

A Component-Based Modeling & Simulation Supporting Environment for Large-Scale Simulation

Teng Da1, Song Xiao1
1 Science and Technology on Aircraft Control Laboratory, School of Automation Science and Electrical Engineering,Beihang University, Beijing, China

Abstract. Simulation modelers, engineers and managers are faced with new challenges at large-scale complex simulation application development. To reduce the difficulty of developing such simulation applications, the simulation framework is required to be extensible,

reusable and composable. In order to promote the reusability from coarse-grained federate to fine-grained components, this paper proposes a modeling & simulation environment which consists of component-based architecture, modeling methods, and simulation services to support and simplify the process of complex simulation application construction. Moreover, a standard process and simulation tools are developed to ensure the rapid and effective development of simulation application.

MoB4
13:30-15:30
Room6
Topic: Computing and Simulation applications in life and biomedical engineering

MoB4-1
Walking Speed Recognition System for Transfemoral Amputee Based on Accelerometer and Gyroscopes
Yanli Geng, Yang Peng [1], Zuojun Liu[1], and Xinran Wang[2]
[1] Control Science and Engineering College, Hebei University of Technology, Tianjin 300130, China
[2] Control Science and Engineering College, Shandong University, Shandong, China
Abstract. A sensor system for walking speed recognition is designed. The sensor system is composed of accelerometer MMA7361L and gyroscopes ENC-03, which used to obtain walking information of transfemoral amputee. The sensor system is installed in prosthetic socket. The input signal of intelligence lower limb prosthesis is provided by this system. The signal of sensor system is collected by Quanser semi-physical simulation platform. The signal is decomposed by wavelet transformation and the useful signal is reconstructed. Feature value of that signal is extracted. K-Nearest Neighbor (kNN) algorithm is used in pattern recognition. The results of experiment indicate that the sensor system has advantages of small size, sensitive response, quickly and effectively identify amputees walking speed and so on.

MoB4-2
Lumbar Finite Element Analysis and Experimental Study Based on the Biomechanical Properties
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[2] Department of Orthopaedics, Affiliated Hospital of Nantong University,
Nantong 226019, China
Abstract. The objectives of this study were to investigate the stress distribution in the lumbar spine before and after the removal of nucleus pulposus, explore the effects of discectomy on the stress distribution and compare biomechanical experiments results with computer simulation results. Three-dimensional finite element model of lumbar L4-L5 was established, the normal and discectomy disc was simulated, the finite element analysis software Abaqus6.9 was used to study von mises stress on the vertebrae and intervertebral disc. Doing biomechanics experiments with sheep lumbar spine whose anatomy and morphology was similar with people, comparing the stress values of the measurement points with simulation results. After discectomy, the human lumbar annulus stress under flexion had an increase of 13.8%, and the sheep lumbar biomechanical experimental results were consistant with simulation results.

MoB4-3
Multi-Class Feature Extraction Based on Common Spatial Patterns of Multi-Band Cross Filter in BCIs
Banghua Yang[1], Meiyan He[1], Yanyan Liu[1], and Zhijun Han[1]
[1]Department of Automation, School of Mechatronics Engineering and Automation; Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, Shanghai 200072
Abstract. The CSP (Common Spatial Patterns) has been proved to be an effective feature extraction method in Brain Computer Interfaces. It is widely used for two-class problem. In this paper, the CSP algorithm is expanded to realize the EEG feature extraction for three-class problem. Firstly, the 8 ~ 30 Hz frequency band is divided into eight cross frequency bands and original EEG signals are filtered according to the eight bands. Each filtered signal can be regarded as a new channel. Then the “one to one” strategy is applied to the CSP for three-class problem. Finally, the proposed method is used to analyze the data from BCI Competition IV and the experimental data from our laboratory. The obtained features are input to SVM (Support Vector Machine) for classification. Comparing the proposed method with simple CSP, the accuracy of the former is higher than the latter by 10%.

MoB4-4
Study on the Reproduction of Vocal Fluctuations Using Box-Muller Method for Artificial Synthesis
Tomohisa Okawa[1], Takaaki Kondo[1], Shun Kadoi[1], Kyouhei Kamiyama[1] and Hiroyuki Kamata[2]
[1] Graduates School of Science and Technology, Meiji University, Japan
[2]School of Science and Technology, Meiji University, Japan
Abstract. Human speech waveform has been synthesized in many ways. Today, text-to-speech synthesis has become the mainstreams in speech synthesis. However, this technology requires a large amount of data to make high-quality speech synthesis. For this reason, it is impossible to create a synthesized voice of many people. In this study, we aim to create a synthesized speech by focusing on the fluctuations of the vocal cords. By using Box-Muller method, we try to reproduce the

fluctuations of the vocal cords. In the Box-Muller method, the average and variance values of the Gaussian function is used. In this paper, we extract the fundamental frequency and frequency variance value from the human voice. We expect that this result can help to reproduce the naturalness of the human voice.

MoB4-5

Shepherding Behaviors with Single Shepherd in Crowd Management

Meng Li [1], Zhiwei Hu [1], Jiahong Liang [1], and Shilei Li [2],
[1] College of Mechanical Engineering and Automation, National University of Defence technology, 410073 Changsha, P.R. China
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Abstract. Crowd management is to systematically plan and supervise the orderly movement and assembly of a crowd. Shepherding behaviors are a class of flocking behaviors in which one or more external agents (called shepherds) try to control the motion of another group of agents (called a flock), it has a leading application in influencing the behavior and activities of a potentially hostile crowd and bringing a mob engaged in a riot under control. In this paper, we focus on investigating shepherding behaviors with single shepherd in normal situation. In our approach, we use a global dynamic planning algorithm which is the multi-agent planning algorithm in dynamic environment to update the next region occasionally where the flock will be steered to. Also, in order to cope with unexpected events in emergency situation, we combine shepherding behaviors with behavior selection mechanisms which are implemented in rules. The simulation results show that our approach which is validated in an urban circumstance is effective and feasible.

MoB4-6

Finite Element Analysis of Asymptomatic TMJ Disc during Mouth Opening

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Abstract. In the temporomandibular joint (TMJ), overloading induced by big mouth opening appears to be important in the casade of events leading to temporomandibular disorders (TMD). In this study, the stress distribution of the disc was explored during big mouth opening. For this purpose, finiteelement models of the disc of different mouth opening degree were used. The disc was loaded with its real displacement for 18 different states of mouth opening. In the model, the posterior zone suffered higher tensile stress, and the stress level increased with the progress of the opening movement. The compressive stress level in the intermediate zone is much smaller, and kept unchanged through mouth opening. Lower tangential stresses were found in the healthy articular disc during mouth opening. This indicates that stress distribution in the articular disc changed with the progress of the opening movement. Excessive mouth opening can induce tissue damage.

MoB4-7

Simulation of Constant Resistance Knee Flexion Movement

Chengzhu Zhu, Jian Jin*, Yunhao Sun, and Anbing Zheng
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Abstract. In the lower limb training process, incorrect training methods can't improve the diathesis of lower limb, moreover, it may make injury to the body of athletes. With the development of sports biomechanics knowledge and computer modeling simulation technology, in the sports training practice coaches make use of human motion simulation methods to carry kinematics and dynamics simulation of athletes lower limb training so that the quantitative training indicators can be got to specific athlete. In this paper a novel human-computer modeling and simulating software—The Anybody Modeling System is adopted. Coupling modeling of human lower limb and training instrument is built, and simulation of training is made. The force status of lower limb muscles are analyzed in the process of constant resistance knee flexion movement, and the results provide a basis to develop quantitative training.

MoB4-8

A Stochastic Lotka-Volterra System and Its Asymptotic Behavior

Liangjian Hu, Juanjuan Zhao
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Shanghai 201620, P. R. China

Abstract. In this paper, we investigate a new Lotka-Volterra system $dx(t)$ = diag($x_1(t)$,。。。,; $x_n(t)$)[(b + Ax(t))dt + ó$x(t)^p$dw(t))];where w(t) is a standard Brownian motion, and x^p is defined as $(x_1^p, 。。。x_n^p)^T$.Population systems perturbed by the white noise have recently been studied by many authors in case of p = 0 and p = 1. The aim here isto ¯nd out what happens when p >1/2 . This paper shows environmen-tal Brownian noise suppresses explosions in this system. In addition, we examine the asymptotic behavior of the system.

MoB4-9

Mechanical Model of a Novel Executive Mechanism for Artificial Anal Sphincter System

Enyu Jiang[1], Peng Zan[1*], Suqin Zhang[2], Jinding Liu[1], Xioajin Zhu[1],
and Xiaohua Wang[1]
[1] Department of Automation, College of Mechatronics Engineering and Automation, Shanghai University; Shanghai Key Laboratory of

Power Station Automation Technology, Shanghai, China
[2] Naval Aeronautical Engineering Institute Qingdao Campus, Qingdao, China
Abstract. The artificial anal sphincter is used to simulate the normal operation of the anal. It can solve the anal incontinence and relieve patients' life and psychological pressure. The artificial anal sphincter system proposed in the paper is based on a novel executive mechanism. The novel executive mechanism uses a hinge structure to clamp the rectum. To ensure the mechanism's reliability, a mechanical model between the novel executive mechanism and rectum is established to predict the deformation of the rectum when compressed in the radical direction. The results show that the deformation can be controlled by adjusting the spring force.

MoB4-10

Accurate Capture Control of the Bottle Cap Based on ILC

Wenju Zhou 1,2, Minrui Fei1, Xiaobing Zhou1
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2School of Information and Electronic Engineering, Ludong University,Yantai 264025, China
Abstract. In this paper, the ILC (iterative learning control) method for controlling camera to accurately capture the cap target is proposed. The experiment setup of controllong camera is also built. Based on the experiment setup, the simulation model is established, and the convergence properties of model are analyzed. The goal of the paper is to reduce the effect of the repeatable disturbance in accurate capture control system. As the main contribution of this paper, it was shown that the camera can be controlled accurately on the time domain, and the range of the gain of the learning rule is obtained. The simulation and experimental results show that the proposed method can be applied not only to time-invariant system, but also to time-varying system.

MoB5
15:50-18:10
Room6
Topic: Computing and Simulation applications in education/ medical field/military field

MoB5-1

Expert System Application in Simulation Tutoring for Weapon Utilization

Danhua Peng[1], Xiaohong Shi[1], and Ge Li[1]
1College of Mechatronics Engineering and Automation, National University of Defense Technology, Changsha, China
Abstract. According to the characteristics and requirements of simulation tutoring system for weapon utilization, a hybrid rule-based expert system was designed to offer intelligent assists during the teaching process. The architecture and function of the simulation tutoring system were introduced firstly. Then with the disadvantages of production system analyzed, a kind of XML-based production knowledge representation was presented. Combining the object-orient method and XML technology, the rule-based expert system can make rules flexible-defined, intuitionistic and easy to access. In order to reason conveniently, fact base was also built in the form of XML, which leads to efficient inference. With examples given, the detail of knowledge representation was interpreted, the design of rule base and fact base were described, and the process of inference was illustrated. The implementation proved that the expert system can reason on students' operations according to rules and return inference results, which met the requirements well.

MoB5-2

Design of the Teaching Demonstration Platform of Missile Control System

Tao Yang[1], Xiaofei Chang[1], Wenxing Fu[1], and Jie Yan[1]
1College of Astronautics, Northwestern Polytechnical University, Xi'an ,China
Abstract. According to the lacking of teaching experiments in design of missile control system course, a teaching demonstration platform is built. In this paper, the general scheme of the design is completed, and the system is departed to teacher-control-terminal and student-design-node based on client/server model. The simulation is demonstrated vividly through the steering engine, 3D visual simulation, and trajectory of the missile. Some pieces of the software including Matlab, RT-lab and Vega are integrated to design the frame of software, and the running flow of the software is given. Finally, the contents of the experiment are introduced. The teaching experiment shows that this system is useful to help students understand the composition and design methods of typical control system. The operation of the system is simple, intuitive and vivid.

MoB5-3

The Study on Integration Between General Mobile Device and Desktop Virtual Reality System

Meng Wang[1], Binjie Xu[1], Zhenggong Han[1],and Dekun Chen[1]
1 School of Mechatronic Engineering and Automation, Shanghai University；Shanghai Key Laboratory of Manufacturing Automation and Robotics 1, China
Abstract. This paper presented a lightweight, low cost, quasi-real-time distributed virtual reality system to verify the feasibility of the idea of college freshmen navigation. Desktop virtual reality system with Virtools was achieved with the real size of the Web-3D scenes and virtual 3D character behavior. Based on iOS and Android,mobile platform was achieved a custom Google Map Web-2D scenes and characters of 2D. Through the VR shared database and mobile terminal local VR library, data synchronization

was realized in the system.

MoB5-4

An Improved DES Anti-DPA Algorithm and Its Automatic Simulation System

Jingjing Liu[1], Shiwei Ma [1], Guanghua Chen[1], Hui Tao[1], Long Qin[1], and Weimin Zeng[1]
1School of Mechatronic Engineering & Automation, Shanghai Key Laboratory of Power Station Automation Technology, Shanghai University, China

Abstract. Based on the analysis of DES cryptographic algorithms and anti-attack strategy, this paper proposes an advanced DES anti-DPA attack algorithm by further improving the Mask method in the power consumption points and the simplicity of working codes. And then, we focus on establishing the algorithm and the validation model by using SystemC, after completing the circuit design of such a DES cryptographic coprocessor that meets the requirement of NFC applications. In order to reduce the development time and costs, we construct a set of automatic simulation system for SystemC model and the RTL circuit. Results of the simulation of this experiment procedure are given to prove the proposed algorithm and design effective.

MoB5-5

Finite Element Analysis of Mice Tibia under Impact Loading

Nan Chen[1], Qing Luo[1], and Qiguo Rong[1]
1College of Engineering, Peking University,China

Abstract. Fracture is one of most common injuries in the clinical diagnosis, mainly existed by the kind of stress fracture. With the fast development in sports area, not only the olds but also more and more young athletes may suffer the disease, usually happening under an impact. Currently there are only limited tests to predict the fracture such as BMD (bone mineral density) testing or biopsies of microdamage, but none of them was specific enough. Under such circumstance, this study will try the FEM (finite element method) to find out the process of impact fracture. A free-fall device was set up and a geometry model of mice tibia was created based on a real one. The results show that under the condition of no fracturethe maximum stresses occurred at two crooks, 1/3 below the knee joint of the tibia and 1/3 above the ankle joint, which were the same with clinical diagnosis statistic. In addition, an experiment was conducted with the same device, and the results were matched with the FEM simulation. Therefore this model of simulation was well suitable for the study on impact fracture, and would help in future fracture prediction.

MoB5-6

The Model of Target Value Judgment Based on Fuzzy Logic Illation System

Wei Chen[1], Haiyang Zhu[1], Feng Qiu[1], Bo Sun[1], and Mingqi Guan[1]
1Department of Logistics Command, Air Force Logistic College, Xuzhou,China

Abstract. By applying the theory of fuzzy logic illation system into the model of target value judgment, this paper implements the model by fuzzy logic toolbox of Matlab. This model can full utilize the experience of specialist and target information of target value element. It can offer a scientific and effective support for commander.

MoB5-7

Research of Quick Processing Mechanism for Massive Battlefield Situation Data in Combat Simulation

Wei Shao[1], Xiying Huang[1], and Dinghai Zhao[1]
1Academy of Armored Force Engineering, Beijing,China

Abstract. In the combat simulation, the battlefield situation data need be stored and visualized, but battlefield situation data volume is becoming larger, it is difficult to handle, we build compression and decompression mechanism to solve the problem, we also improve the visualization mechanism, the situation information is divided into static type and dynamic type, in the simulation process the dynamic information need be handled from the beginning to the end. Through the two kinds of mechanisms the situation data is handled effectively.

MoB5-8

The Study of Three-dimensional Virtual Battlefield Large Terrain Dynamically Generated

Fanfan Yao[1], Qiang Liang[1], Pei Long[2], and Gaige Huang[3]
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2 Military representation department of 127 factory, Qiqihaer Heilongjiang Province, China
3 Logistics Academy, Beijing,

Abstract. Large terrain three-dimensional visualization immediacy impact third dimension immersion and of virtual battlefield and cover area of warfare simulation mission .Aim at the characteristic of virtual battlefield large terrain visualization, emphasize the study large area terrain visualization technic, and take Digital Elevation Model and satellite photograph of northwest area of China as source data, use multilayer LOD and Virtual Texture, predigest grid and terrain division technic, and use three-dimensional modeling software Creator Terrain studio made a block of large terrain of area about 400X400km2 ,and fulfill the demand of three-dimensional virtual battlefield of warfare simulation.

MoB5-9

Simulation and Analysis of Space Object Visibility Based on Space-Based Optics Surveillance

Xiangchun Liu[1], Ying Liao[1], Yuanlan Wen[1],and Zhi Zhang[1],
1College of Astronautics and Material Engineering, National University of Defense Technology, Changsha, China

Abstract. The visibility analysis model of space object based on space-based optics surveillance is derived from constraints including the earth

masking, the earth shadow, the sunlight and the field of view. According to the orbit distribution character of space objects, we analyzed the visibility of some typical space objects using three groups of observation platform which has low, middle and high orbits respectively. Three helpful results are derived from the simulation experiments. Firstly, the visibility of low orbit space objects is poor, the total time of visible arcs is less than 1 hour in the 24 hours observation. Secondly, there is extremely little influence made by restraints of the earth masking and the earth shadow for the visibility of middle and high orbit space objects. Finally, the visibility of space objects using middle or high orbit observation platform is beneficial than using low orbit observation platform.

MoB5-10

A Modified Daily Heat Demand Forecasting Model for District Heating

Jinsoo Park 1, Yun Bae Kim1*, Chul Woo Jung1, Jeong-Seok Kang2
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2 Dept. of Management of Technology, Sungkyunkwan University, Cheoncheon-dong 300, Jangahn-gu, Suwon, Republic of Korea

Abstract. To control the district heating efficiently, accurate heat demand forecasting is required. As the heat demand has a close connection with the demands of the previous days, general autoregressive methods are applicable to heat demand forecasting. Some exceptional situations such as the low demand in weekends or vacation periods lower the forecasting accuracy. Besides, the outdoor temperature might affect the demand. We introduce a modified multiple regression model to forecast daily heat demand to overcome these situations. The temperature and the past seven days' demands are used as the factors of future demand. Numerical examples applied to historical data are provided at the end of the paper.

MoB6-a
13:30-15:30
Room7
Topic: Computing and Simulation applications in military field

MoB6-a-1

Feature Separability Evaluation for Advanced Radar Emitter Signals

Bin Zhu[1,2], Wei-dong Jin[1], Zhi-bin Yu[1], and Mei-jun Duan[1]
1School of Electrical Engineering, Southwest Jiaotong University, China
2School of Electron Engineering, Yangtze Normal University, China

Abstract. For the realization of feature separability evaluation for advanced radar emitter signals (RES), the evaluation methods of feature separability of advanced radar emitter signals were proposed based on four kinds of measure. It reflects the within-class aggregation and class separation of the feature clustering through the maximum of within-class Euclidean distance, the sum of within-class Euclidean distance, the variance of within-class Euclidean distance and the sum of Euclidean distance between classes. The corresponding measures were calculated by using six typical advanced radar emitter signals. The results show that this method is effective and feasible, and can implement the feature separability evaluation for advanced radar emitter signals.

MoB6-a-2

Research on Anti-ARM Model with Outboard Active Decoys

Yupeng Xie[1], Zhongjie Wang[1], Jiangang Yan[1], and Yanbo Song[1]
1Department of Command, Naval Aeronautical and Astronautical University, China

Abstract. As ship-borne radar system is composed of various types of radars, it can't be simplified as single radiation source when the warship adopts active decoy to deal with anti-radiation missile (ARM). By analyzing working characteristics of ARM, attacking models of ARM to ship-borne radars with active decoys were built. The simulation results show that burst points of ARM are in dense distribution around the ship-borne radars, which still pose a threat to ship-borne radar system.

MoB6-a-3

Research on Anti Saturation Attack Model of SAM to ARM

Jiayou Zeng [1], Yupeng Xie [1], Hongfei Bian [1], and Cao Lv [1],
1Department of Command, Naval Aeronautical and Astronautical University, China

Abstract. By establishing efficiency indexes of ship-to-air missiles (SAM) weapon system, serving process of SAM for anti-radar missile (ARM) were quantitatively derived. Basing on countermeasure process of SAM operation, the anti saturation model of SAM to ARM was built on Monte Carlo, which includes numerical characteristic of shooting stream, threat estimation, firepower distribution, interception and effectiveness estimation. Simulation results demonstrate the effectiveness of this model, which lay a foundation for further quantitative research on operations of SAM.

MoB6-a-4

Design and Integration of Hardware-in-the-Loop Simulation System for Certain Missile

Xiaofei Chang[1], Tao Yang[1], Jie Yan[1], and Mingang Wang[1]
1College of Astronautics, Northwestern Polytechnical University, Xi'an , China

Abstract. Hardware-in-the-loop simulation is generally large distributed heterogeneous real-time system. Its overall scheme design and system integration is essential. According to the mission requirement of flight control system simulation experiment for certain missile, the

frame of the distributed hardware-in-the-loop simulation system is designed. The nodes are divided into server, client and monitor. And the composition of the system is given. The stage of system integration test is divided into interface matching test, open-loop following test and closed-loop simulation test. The methods and steps are introduced in detail, and the content of bias simulation is enumerated. Finally, the contrastive results between the digital simulation and hardware-in-the-loop simulation are given, and the deviation is preliminarily analyzed. The study shows that the simulation system meets the demands of design, and the flexibility and reliability of the simulation system are enhanced.

MoB6-a-5

Design of the Virtual Training Platform for Carrier Aircrafts Approach and Landing

Xianjian Chen1, Gang Liu2, and Guanxin Hong1
1.School of Aeronautic Science and Engineering, Beihang University, China;
2.National Laboratory for Aeronautics and Astronautics, Beihang University, China

Abstract. A virtual training platform for carrier aircrafts approach and landing is designed based on virtual reality technology. Distributed framework is adopted, and every node of the system is introduced in detail. Then it gives a method of real-time communication using Reflective Memory technology in this paper. And it introduces the logical relation and integration of dynamic modules of three types of landing. The environmental library of training platform of approach and landing is built with 3d graphics engine. The 3d visual models are built using DOF and texture mapping technology. And the scheme of voice communication between LSO and pilots is proposed. Then it analyses the problems of collision detection. Finally the global visualization is given.

MoB6-a-6

An Experimental Approach for BMDS Effectiveness Analysis

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1National University of Defense Technology, Changsha, China

Abstract. The problem of ballistic missile defense system (BMDS) effectiveness analysis has been highly concerned for years. In this paper, a simulation study of BMDS is fulfilled by accomplishing large number of experiments. In order to improve the simulation efficiency, the orthogonal design methodology is adopted to arrange experiment plans. After resultant data are selected, the variance analysis method is employed to analyze the relativity between variable parameters and indexes. In the end, two demos are given to show how the approach works.

MoB6-a-7

The Modeling and Simulation of Command and Control System Based on Capability Characteristics

Huijing Meng1and Xiao Song1,
1Science and Technology on Aircraft Control Laboratory, School of Automation Science and Electrical Engineering, Beihang University, China

Abstract. Command and control are key factors in a variety of military theories . Command and control system simulation, uses computer simulation technology to examine the performance of designed command post system in a virtual environment, which has been the basis for an assessment or optimization of command post system . This paper analyzed the shortcomings and deficiencies of the current command and control system modeling, and proposed a command and control system modeling based on the entity-relationship. Combined with the Lanchester model considering efficiency of command this paper takes command and control system models for scenario analysis.

MoB6-a-8

Based Acceleration Compound Control with Equivalent Input Disturbance Observer for Flight Simulator

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1Beijing Changan Auto Engineering Research Co.Ltd, Beijing,China
2School of Automation Science and Electrical Engineering, Beihang University, Beijing,China

Abstract. Friction torque is the main factor that influences dynamic response performance of high accuracy of servo systems at low speed movement. To compensate for the friction torque and other disturbances, a compound control strategy based on backstepping and acceleration feedback with the equivalent input disturbance observer is proposed. In this control strategy, make use of the state-observer to estimate the equivalent disturbance, and obtain the acceleration estimation. The acceleration feedback controller is introduced to compensate for friction torque and disturbances; the backstepping controller with integral element is used for the position loop. The simulation results show that dynamic friction torque is inhibited more effectively, and the robustness of system for the exterior disturbance is also improved simultaneously.

MoB6-a-9

Adaptive Backstepping Sliding Mode Controller for Flight Simulator Based on RBFNN

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1. School of Automation Science and Electrical Engineering, Beihang University Beijing, 100191, China
2. Science and technology on space system simulation laboratory, Beijing, 100854, China

Abstract: For flight simulator system, a kind of Adaptive Backstepping Sliding Mode Controller(ABSMC) based on RBFNN observer is presented. The sliding mode control theory is famous by its characteristic that it is insensitive to the external disturbances and parameters uncertainties. Combining this characteristic with

Backstepping method can simplifies the controller design. And the addition of the terminal attractor can make the arrival time shorten greatly. However, too large external disturbances and parameters uncertainties are still not allowed to the system, and the design process of ABSMC doesn't have the upper bound information of disturbance until a RBFNN(Radial Base Function Neural Network) observer is designed to solve the problems. The simulation results show that the proposed scheme can improve the tracking precision and reduce the chattering of the control input, and the system has a higher robustness.

MoB6-b
15:50-18:10
Room7
Topic: Computing and Simulation applications in military field

MoB6-b-1

The Analysis of Reconnaissance Modeling and Simulation in Combat Simulation

Fan Rui[1], LiHao[2],and Liu Fang[1]
1Department of Equipment Command & Administration Academy of Armored
2 Weapon Equipment Demonstration Center Force Engineering,Beijing, China

Abstract. The modeling and simulation of reconnaissance is a important part of army combat simulation. The reconnaissance system is the complex combination of many reconnaissance equipments such as the ground vehicle and air vehicle, and includes different form like sound, light and electricity. Based on the basic conception, reconnaissance action and reconnaissance equipment, paper gives the modeling Analysis of this model. Then, paper gives the composing and structure of reconnaissance system model and uses it to simulation. The result indicates that the model has rational structure and can be used in the combat simulation.

MoB6-b-2

An approach of Targets Selection in the Battle of Attacking Targets S-o-S Wrecked

Yi Liang[1,2], Yequan Cai[1], Xiaoming Luo[2], and Lei Hu[3]
1Science and Technology on Complex Systems Simulation Laboratory,Beijing,China;
2Company of Postgraduate,The Academy of Equipment,Beijing, China;
3Nanjing Military Deputy Bureau, Nanjing, China;

Abstract. Achieving objectives of the operation could be promoted quickly by choosing the targets system leading to worse affected overall situation. However it was difficult to quantify these effects. The targets system-of-system (S-o-S) potential energy was constructed by referring to Quantum states and related concepts in Quantum Theory. A function of potential energy was established by monadic cubic equation, by which the effects of targets systems wrecked were able to be quantified with the value of transition of potential energy. Through the simulation experiments, several points, in which potential energy of target systems descending substantially, are similar to four points in five grades of Battle Damage System : 0.10, 0.35, 0.60 and0.85. The velocity of transition of potential energy can be illustrated by the distance of simulation steps between the potential energy points, which shows that the network structure of targets S-o-S is no-scale as well as the transition of potential energy of system is according with Power Law.

MoB6-b-3

Evaluation of Injure Effect Based on Pixel Simulation

Dengan CHEN[1], Guowei WANG [1], and Hongri CONG [1],
1Department of Command, Naval Aeronautical and Astronautical University, China

Abstract. In view of evaluating the injure effect, a new method based on the real irregular-shaped target image is proposed in this article by analyzing on the distribution of the pixels before and after the shooting test. Through using different gray level to represent the different importance of the target, this article expatiate the basic steps of the pixel simulation method in Matlab, and take an example to validate the proposed method, and the simulation results verify the efficiency and feasibility of the proposed method.

MoB6-b-4

Research on IETM Interaction Based-on Multi-Agent

ZongChang[1] Xu, Bo[1] Li, ShuFeng[1] Huang, and Yun[2] Zhao
1 Academy of Armored Forces Engineering, Beijing, China
2 National University of Defense Technology, Changsha ,China

Abstract. On the basis of analysis of the information crisis we have met in products supporting action, this paper described the characteristics of IETM Interaction, and explained the hierarchy of the achievement of IETM interaction in detail. After studying the characteristics of products supporting information systems, in order to improve the information-interaction ability of information systems, the paper introduced the Multi-Agent into the supporting actions, and researched the framework of interaction and the method of information-interaction.

MoB6-b-5

The Wiener Model Identification of Self-Oscillation Actuator

Shuang Wei[1], Baiwei Guo[1], and Hong Xu[1]
1Key Laboratory of Dynamics and Control of Flight Vehicle, Ministry of Education ,
Beijing Institute of Technology, Beijing,China

Abstract. To study the saturation nonlinear phenomena of self-oscillation actuator caused by constructions, a two-step method was proposed to establish its mathematic model by linked Wiener structure. Firstly, the frequency of self-oscillation and effective output signal of

system were obtained by analyzing its spectrum and designing filter. Then, through analyzing the characters of output signal, differential equations and polynomial basis functions were chosen for linear sub-system and non-linear sub-system of Wiener Model, and the parameters were determined by calculating. The validity of mathematic model was demonstrated by simulating.

MoB6-b-6

Research on Virtual Design and Man-in-Loop Simulation

Zhiming Song[1,2] and Shengxiao Zhang[1]
1.Systems Engineering Research Institute, CSSC, Beijing ,China；
2.Beijing China Shipbuilding IT Co .ltd. CSSC,Beijing, China

Abstract. This paper focuses on the difficulties on the research of the modern industrial complex product. Based on the large-scale command and control system, some key technologies are achieved in this paper: the digital design and the human-in-loop simulation; the engineering method at the stages of the project establishment, the product design and the physical prototype test; the solution of some engineering applications.

MoB6-b-7

Research on CSP Model for Complex TT&C Task Scheduling

Zhen Zhu[1], Yongming Gao[2], and Bin Wang[3]
1.Graduate School,The Academy of Equipment,Beijing, China
2.Department of Information&Equipment,The Academy of Equipment,Beijing,China
3.Department of Information&Equipment,Tthe Academy of Equipment,Beijing,China

Abstract. This paper focus on the high frequency of conflict and complex constraints in ground TT&C(Tracking Telemetering and Command) resources scheduling problems. A detailed analyze of resources and requests has been made. Tasks are divided into collections of requests classified by their phases with a sequent based on constraint to describe their logic. Six constraints including equipment matching constraint, time windows constraint, antenna confliction constraint, satellite competition, sequential logic constraint and consumable resource constraint are particularly expressed. To meet the vary preferences from usage of resources to accomplishment of requests by different users,three heuristic principals have been added to the CSP(Constraints Satisfaction Problem) model. In the end of this paper, the model is validated by a simulation.

MoB6-b-8

Research of the Random Noise Compensation of MEMS Gyro

Xiaowen Wu[1] and Qing Li[1]
1Institute of Intelligence Control of BISTU,Beijing,China

Abstract. Feature of Unscented Kalman Filter(UKF) is systematic analysed, and UKF is used in the compensation of MEMS Gyro random noise.Discussion the compensation of MEMS Gyro static random noise and dynamic random noise,The specific use of neural networks and Support Vector Machines in the compensation of MEMS Gyro random noise is proposed.Described in detail how MEMS Gyro random noise is compensated in the project.There is some defective when the time series used to build dynamic mathematical model of MEMS Gyro random noise,advantages and disadvantages of the compensation methodology of the MEMS Gyro random noise used by foreigner are pointed out.

MoB6-b-9

Human Behavior Representation Theory Progress in Constructive Simulation

Shaoyong Shi[1], Zaijiang Tang[1], Quanfeng Ma[1], and Jingye Wang[1]
1Department of Equipment Command and Administration, AAFE,Beijing, China

Abstract. There are higher requirements for human behavior representation (HBR) in constructive simulation. After analyzing the military domain requirements and theory requirements of individual and organization behavior modeling, the basic theory progress of HBR were discussed including motivation theory, behavior decision-making theory, four main cognition schools and four typical cognition structures-SOAR, ACT-R, EPIC and 4CAPS. Their advantages and limitations were indicated. Then, the state of the art of HBR was summarized including the contribution and deficiency of former research. Some recommendations to HBR researchers are listed in the end.

MoB6-b-10

Research on Simulation Method of Material Demand Forecast

Quanfeng Ma[1], Shaoyong Shi[1], and Ying Liang[2]
1Simulation Laboratory, The Academy of Armored Forces Engineering, Beijing, China
2College of Computer and Information Engineering, Tianjin Normal University, Tianjin, China

Abstract. A method of material demand forecast by adopting simulation approach is discussed in this paper. Difficulties in material demand forecast are also analyzed from four aspects of information, method, analysis and judgment. Simulation, as a means of material demand forecast, has its own advantages. Based on the analysis of requirements for material demand forecast, a kind of combat simulation model architecture for material demand forecast is constructed, and the important models are analyzed. Then several design principles and methods for material demand forecast are listed out. Finally, some typical issues about the experiment results are set forth.

MoB6-b-11

Modeling & Simulation for Cyber Physical System

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Abstract :The research of Cyber-Physical System (CPS) has become a hot issue, but the ways of test and evaluation are not mature enough. The current research on CPS stays mainly in theory, and it is hard to find relevant tools about CPS simulations, so the experimental methods and results do not have a universal, authoritative. In this paper, an CPS architecture is introduced at first, and then the availability of using HLA for CPS simulation is discussed. Finally, a modeling & simulation platform based extended HLA is described in detail, including the extended HLA, the resource management federation(RMF), the application sevice federation(ASF), the federation integrated architecture (FIA) and federation executive infrastructure (FEI).

MoA11
13:30-15:30
Room8
Topic: Simulator

MoA11-1

The Application of Modeling for Irregular Objects in the Heavy Driving Simulation System

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Abstract. It is very convenient to simulate regular and static objects by using conventional modeling methods. But for the random dynamic irregular objects, the conventional means of modeling seem to be powerless. Then a new, effective method of modeling—particle system is able to provide simulation availably. This paper elaborates the method of truly simulating the special visual effects of snow in the special vehicle driving simulation system through establishing the models of irregular objects in the particle system. In order to cut down the computation time of the particle system, it reasonably sets up relevant parameters in the system, which improves the system's real-time performance and field simulation effects of the system.

MoA11-2

Modeling and Visualizing of the Mooring System of Anchor Handling Simulator

Zhongxian Zhu[1] and Yong Yin[1]

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Abstract. For the purpose of modeling and visualizing the mooring system of Anchor Handling Simulator (AHS), this paper constructed the dynamics model of mooring system on the base of lumped mass method. Because of the non-linearity of the dynamics equations, the analytic solutions of the equations could not be found. So the numerical method was determined to be used in calculating the model. By calculating the model, the positions and force information of all the lumped mass points in the mooring system can be obtained. Billboard technology was applied when mapping texture to the chain and work wire, and accordingly realized the visualization of the mooring system. Additionally, by applying a series of other visualization technologies, this paper realized the dynamic simulation on the anchor handling procedure of Anchor Handling Vessel (AHV).

MoA11-3

Dynamic Simulation of Fishing Net Based on Cubic B-spline Surface

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1Navigation College, Dalian Maritime University, China

Abstract. To simulate the dynamic behavior of mid-water trawl in fishing simulator, visualization of fishing net base on cubic B-spline interpolation surface by simplifying the geometric model of fishing net is realized, which improves the visualization of scene simulating system of fishing simulator after texture mapping. The result shows that this method improves the real-time and realism visualization of fishing net.

MoA11-4

Research on the Sea Ice Modeling and Collision Detection in Ice Navigation Scene

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Abstract. Ship maneuvering in ice, paid close attention recently, becomes increasingly more and more important in the real navigation activities. Therefore the ice navigation simulator in the application is of great significance for seaman training and research. Referring to the improvement of Koch Curve in fractal algorithm, this paper has analyzed and modeled the sea ice and achieved the visualization of it. Applying the Cohen-Sutherland algorithm of Computer Graphics to collision detection between ice and ship, this paper has implemented the collision detection mentioned above in the scene of the ice navigation simulator.

MoA11-5

Research on Simulation of Low Altitude Penetration Technologies for Target of Radar Training Simulator

Zhansheng Li[1], Chenggang Xie[1], Xiaohong Shi[1], and Cong Zhang[1]

1College of Mechatronics and Automation,National University of Defense Technology, China

Abstract. This paper attempts to research low altitude penetration tactics for target of radar training simulator, to plan the route by using particle swarm optimization algorithm and to verify the feasibility of route by visual simulation. Firstly, the low altitude penetration physical limitations, and terrain following, terrain avoidance, threat avoidance and other special

tactical requirements are analyzed. Particle swarm optimization algorithm is selected for route planning. Secondly, the cruise process is verified by using 3D visual simulation technology. Security and effectiveness of route are tested. Finally, the file of flight route is transmitted to target of radar training simulator. Tactical action of low altitude penetration is achieved and the level of actual combat training is obviously improved.

MoA11-6

The Vector View-up in Computer Graphics

Yicheng Jin[1], Lining Chen[1], Yong Yin[1], Hongxiang Ren[1], and Meng Zhao[1]

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Abstract. In the existing textbooks on computer graphics, the vector view-up (VUP) is often used in lecturing the part of specifying the viewing coordinate system under the world coordinate system. However, the existing way of lecturing the vector VUP can not explain its actual function and exact physical meaning. The new conception of initial VUP is proposed and it is pointed out that the principle of rotating initial VUP around the vector *n* equals to the twist of the virtual camera. Further, for arbitrary vector VUP using initial VUP to allow it rotating twist angle around n axis, its solution method is given. Finally, the function glLookAt() of OpenGL is re-encapsulated. The scene rendering test on navigational simulator shows the proposed method is correct.

MoA11-7

Research on Coroutine-based Process Interaction Simulation Mechanism in C++

Xiao Xu[1] and Ge Li[1]

1College of Mechatronics and Automation, National University of Defense Technology, China

Abstract. Process Interaction (PI) is a typical simulation strategy. Its traditional implementation is thread-based in which each thread is extended as an entity process. In this paper we discuss aspects of a coroutine-based PI simulation mechanism in C++. It provides a set of classes to implement entity processes, scheduling processes, resource management and data collecting. As C++ does not provide coroutine natively, we investigate implementing it by establishing additional libraries. We also present general benchmarks showing our coroutine implementation performance. At last a simple queuing example is given to evaluate our mechanism, which leads to a significant speedup over the thread-based approach.

MoA11-8

Successive Visualization of High Frequency Electromagnetic Wave Propagation Using Multi-thread on CAVE System

Hua Xie[1] and Mitsunori Makino[1]

1Department of Information and System Engineering, Chuo University, Japan

Abstract. In order to let administrators know their QOS of wireless LAN both in convenience and safety from service range, an interactive and immersive visualization of high frequency electromagnetic wave propagation on the CAVE has been studied by authors. In the previous study, to make volume data of the propagation may take a lot of time in advance of displaying them on the CAVE. Therefore in this paper, improvement on reduction of user's waiting time is considered. Successively making volume data with priority is introduced, instead of reduction of making volume data with less quality. Also, applying multi-thread programming to the proposed improvement, we balance visualization with the making data. Finally, we can view and operate more rapidly and conveniently the propagation through the new interactive visualization system.

MoA11-9

Compound Disturbance Observer for Flight Simulator

Youmin Liu[1], Yong Deng[2], and Dapeng Tian[1]

1School of Automation Science and Electrical Engineering, Beihang University, China

2Beijing Institute of System Engineering, China

Abstract. This paper presents estimation of disturbance to create a compound disturbance observer based on sliding modes. Disturbance observer(DOB) and sliding mode control are both effective methods in motion control. However, DOB is confined to nonlinear disturbance while sliding mode control(SMC) is limited by chattering phenomenon. The proposed method uses sliding mode to compensate the dynamic nonlinear equivalent disturbance and the switching gain of sliding mode, which is designed by disturbance estimation error using fuzzy mapping. The method also helps to decrease chattering with the help of DOB. The validity of the proposals is confirmed by experiments.

MoA11-10

Systematic Technique to Model Origami Structures by Using Conformal Transformation

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1 Meiji Institute for Adcanced Study of Mathematical Sciences, Meiji University, 1-1-1, Higashi Mita, Kanagawa, Japan 2 Art Excel Co.,Ltd., 2-6, Kuzuha Misaki, Osaka, Japan

Abstract. In this paper, a new technique is shown to obtain developed patterns of conical origami shells from ones of cylinders by using the conformal transformation. It enables to design foldable structures systematically, controlling angles among fold lines for maintaining advanced functions particular to origami such as foldability, expandability, inflatability and so on. Also, it is described the mathematical interrelation of two-dimensional origami patterns between cylinders and conical shells, and advantages on applying the mathematical technique on designs of origami structures. The method is to help us to imagine and model new foldable functional structures

MoB6-c
15:50-18:10
Room8
Topic: Computing and Simulation applications in military field

MoB6-c-1
Weapon Target Assignment Decision Based on Markov Decision Process in Air Defense
Yaofei Ma[1], and Chaohong Chou[1]
1School of Automation Science and Electronic Engineering, Beihang University,Beijing, China
Abstract. This paper proposed a MDP based approach to resolve the weapon target assignment (WTA) problem in air defense domain. Considering the dynamic and stochastic nature of this problem, WTA is firstly decomposed into several sub-problems, the optimal strategy of which is easily to compute since the state space is very small. The strategies of sub-problems are combined to form global assignment strategy, in that a Minimum Marginal algorithm is employed for conflicts resolution. By this way, an approximate optimal WTA policy is obtained with reduction of computation complex.

MoB6-c-2
Study of CGF Task Simulation System Based on HLA
Fei Jie[1] , Fengxia Li[1], Zhaohan Lu[1], and Binghui Geng[1]
1Beijing key laboratory of digital performance and simulation technology,Beijing Institute of Technology, Beijing, China
Abstract. This paper analyzes the importance of the task information in military simulation, discusses the different multi-resolution modeling (MRM) methods, designs and realizes a MRM simulation system based on HLA. Combat entities were modeled with aggregation-disaggregation method and the task information of the entities was built MRE models. The task MRE could maintain consistency of tasks in different levels of resolution strictly by maintaining all task details among all levels of resolution. And the combat entities would not consume too much simulation resources in the aggregation-disaggregation model. In the simulation federation, a task manage federate was constructed to maintain the task information in the whole simulation process which could interact with other federates by distributing task information and receiving feedbacks. Moreover, the task information in the task manage federate was used to visualize the task of combat entities in the 3D scene which could intuitionally show the intentions of entities.

MoB6-c-3
Research of Aiming Error and Its Application in CGF Tank Firing Model
Changwei Zheng[1], Qing Xue[1], Xiaoming Ren[1], and Guanghui Li[1]
1College of Armored Force Engineering, Beijing, China
Abstract. Based on the effecting factors of aiming error on firing precision in the gunner shooting procedure, it builds the aiming error model and shooting reaction delay model which compose the CGF tank aiming model with high precision. It makes the aiming action more realistic in CGF tank model which improves the fidelity and validity of system and it is conducive to enhance the efficiency of gunner's shooting and tactical training system.

MoB6-c-4
Command and Decision-Making Model for Armored Weapon Platform Based on Multi-Agent
Changyi Chen[1], Xinjun Zhao[1], Yongxian Zou[1], Baili Qi[1], and Lingjie Kong[1]
1Beijing Special Vehicle Research Institute, Beijing, China
Abstract. After study on the character of the weapon platform, a new command and decision-making model based on multi-agents is presented in this paper. Through discussing the producing process of commanding activity, this paper put forward the cooperation model of multiple weapon platform based on KQML language in order to realize cooperation between multiple agents. At last, decision-making agents are given autonomous decision and self-inference abilities in the new command and decision-making model by using Artifical Neuro-Network Fuzzy Inference System.

MoB6-c-5
Research on the Distributed Environment Module of SPMM
Shengjie Wang[1, 2], Fengju Kang[1,2], Huizhen Yang[1,2], and Hong Han[1,2] ,
1Marine College of Northwestern Polytechnical University, Xi'an, China
2National Key Laboratory of Underwater Information Process and Control, Xi'an, China
Abstract. To solve the big traffic problem caused by centralized environment model in the Simulation Platform of Military-intelligent-UUV based on MAS (SPMM), proposed a distributed environment model, extracted the environmental elements for concept modeling by taking the environment as an intelligent and dynamic object, designed the operation system structure of the distributed environment model, and advanced a method that combined the distributed environment with interest management. The simulation verified that the method can effectively reduce the traffic between UUV and the environment, and help keeping the space consistency. The research provided technical support for SPMM.

MoB6-c-6
odeling and Simulation of Pilot Behavior Interfaced with Avionics System
Huaxing Wu[1], Fengju Kang[1], Wei Huang[2], and Yi Lu[2]
1Marine College, North Western Polytechnical University, Xi'an, Shanxi, China
2Aeronautics & Astronautics Engineering College,

Air Force Engineering University, Xian, Shanxi, China

Abstract. To represent the complex behavior of a human pilot operating a fighter aircraft, an agent-based modeling and simulation method is proposed in this paper. First a live virtual constructive simulation platform including an agent-based avionics system model is introduced as a test-bed. Through refining the interface information flow between a pilot and avionics system, employing fuzzy reasoning to mimic the information processing of human, and applying Bayesian network to situation assessment, then using fuzzy Petri-net to make decisions and plan actions, the hybrid agent-based pilot model will sense, think, learn and act as a human pilot do. The ongoing effort indicates its feasibility and validity.

MoB6-c-7

Research and Application of Tank Gunners' Skills Model in Operation Simulation

Guanghui Li[1], Junqing Huang[1], Jian Han[1], Yanping Fan[1]

1Department of Equipment Command and Administration, Academy of Armored Force Engineering, Beijing, China

Abstract. Troops' forces not only have a relationship with weaponry equipment, but it is also related to operation skills of equipment-users tightly. Battle models using in operation simulation reveal weaponry capability, furthermore, skill element of warriors must be taken for account. By using the man-in-loop simulation experiment modeling method which the gunner takes participate in, this article analyses distribution principles of aiming-point, building the gunner's aiming precision model. Moreover, through exploring differences of gunner's individual skills on the basis of the mentioned work, gunners' operation skills distribution model including aiming-point judgement capability difference model and manipulation capability difference model is built. Moreover, by applying this model in operation simulation, the fidelity of operation simulation can be enhanced.

MoB6-c-8

Research of Army Battle Parallel Simulation Method Based on Function Modules

Yalong Ma[1], Qingjun Huang[1], Ming Sun[1]

1Armored Forces Engineering, Beijing, China

Abstract. There is huge computing in the modern battle simulation, for the models with so many amounts and so small granularity, complex hiberarchy of simulation system. Adopting parallel simulation is the current method. The paper gives the parallel scheme based on function modules from present function and structure of simulation system. The method needs division and coalition of function modules based on the time of computing and communicating. The example suggests that the method has a certain efficiency and good value from the existing system.

MoB6-c-9

Multi-aircraft Cooperative Target Allocation in BVR Air Combat Using Cultural-Genetic Algorithm

Ni Li[1], Wenqing Yi[1], and Guanghong Gong[1]

1School of Automation Science and Electrical Engineering,Beihang University,China

Abstract. According to the characteristics of BVR (Beyond Visual Range) air combat, a mathematical model of multi-aircraft cooperative target allocation problem was built. Also a Cultural-Genetic Algorithm is proposed to solve this problem, which integrates cultural algorithm and genetic algorithm effectively. Based on the framework of Cultural Algorithm, Genetic Algorithm is selected as the evolutionary algorithm of population space. The knowledge of reasonable allocation plans is extracted from population space and stored in a belief space, which will influence the selection and mutation operation of Genetic Algorithm to make the optimization fast and accurate. Simulation results on typical application instances show that this algorithm is more efficient in performance than traditional Genetic Algorithm.

MoB6-c-10

Secure and Semantic Repository for Weapon Models in the Cloud

Hyunhwi Kim[1], Chanjong Park[1] and Kangsun Lee[1]

1Department of Computer Engineering, MyongJi University, South Korea

Abstract. Simulation-based weapons analysis requires significant efforts to represent the complex structure and dynamics of weapon systems on the computer. A model repository can help model developers to save their development costs and time by utilizing predefined and already validated weapon models. In this paper, we introduce OpenREM (Open REpository for weapon Models) which has been developed to store weapon models in the cloud data storages. OpenREM provides a semantic search service to reuse semantically similar models, despite of their structural and textual differences. OpenREM also prevents and detects possibly security probes, and employs an intrusion tolerant mechanism to be able to survive through security threats.

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Liu,Gang	**MoB6-a-5**
Liu,Guoying	**MoB1-b-1**
Liu,Hongliang	**SuA7-a-7**
Liu,Jiayu	**MoA14-5**
Liu,Jie	**MoA11-1**
Liu,Jinding	**MoB4-9,MoB5-4**
Liu,JinXia	**SuA7-b-8**
Liu,Jun	**SuA3-2**
Liu,Mandan	**SuA9-5**
Liu,Qingwei	**SuA9-5**
Liu,Shuo	**SuA4-1**
Liu,Tingyao	**SuA9-2**
Liu,Xiangchun	**MoB5-9**
Liu,Xiaocheng	**SuA9-8**
Liu,Xiaodong	**SuA9-4, SuA1-c-8,MoB6-a-9**
Liu,Xu	**SuA6-4**
Liu,Yanyan	**MoB4-3**
Liu,Ying	**SuA4-3,SuA2-b-7,MoB6-a-8**
Liu,Youmin	**MoA11-9**
Liu,Yuanyuan	**SuA1-b-2**
Liu,Yunfei	**MoB2-6,MoB1-b-3**
Liu Zhong	**MoA13-b-9**
Liu,Zhenghua	**SuA4-3,MoB6-a-8**
Liu,Zuojun	**MoB4-1**
Long,Pei	**MoB5-8**
Long,Yong	**MoA13-b-2**
Lorant,Allan	**SuA1-d-9**
Lou,Wei	**SuA7-b-3**
Lu Di	**MoA13-b-9**
Lu,Yi	**MoB6-c-6**
Lu,Zhaohan	**MoB6-c-2**
Luo,Pi	**MoB2-1**
Luo,Qing	**MoB5-5**
Luo,Wenzhong	**SuA6-5**
Luo,Xiaoming	**MoB6-b-2**
Lv,Cao	**MoB6-a-3**
Lv ,Xiaoting	**MoB1-c-9**
Lv,Shuai	**MoB2-6**
Lv,Tian	**SuA1-b-2**
Lv,Yandong	**SuA5-7**
Lv,Zhenhua	**SuA3-4**

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Ma,Cheng	**SuA1-d-5**
Ma ,Haiping	**SuA1-d-10**
Ma,Jie	**SuA1-b-7**
Ma,Junwei	**SuA2-b-9**
Ma,Ping	**SuA4-2,MoA13-a-3, SuA7-b-10**
Ma,Quanfeng	**MoB6-b-10,MoB6-b-9**
Ma,Shiwei	**SuA2-a-6,MoB5-4, SuA7-a-8**
Ma,Xiaofei	**SuA7-b-4, SuA4-10**
Ma,Yalong	**SuA1-a-3,MoA13-a-1 ,MoB6-c-8**
Ma,Yaofei	**MoB1-a-3,MoB6-c-1**
Mai,Jingeng	**SuA1-b-9,MoB2-8**
Makino,Mitsunori	**MoA11-8**
Mao,Dekang	**MoB3-b-2**
Mao,Shaojie	**SuA1-c-5**
Mao,Shaojie	**SuA2-b-4, MoA13-b-9**
Marurngsith,Worawan	**SuA9-9**
Matsuda,Yoshihisa	**MoB3-b-1**
Matsutomo,Shinya	**MoA13-a-6**
McKay ,Alison	**MoB2-10**
Meng,Huijing	**SuA8-2,MoB6-a-7**
Meng,Rongqing	**MoB2-2**
Meng,Xiuyun	**SuA4-4,SuA4-7,MoB1-d-6**
Miyamoto,Tomoyuki	**MoA13-a-6**
Mizuno,Shiori	**MoA13-b-4**
Mizuno,Tadanori	**SuA1-c-2**
Mongkolsin,Yanyong	**SuA9-9**
Mou,Yongxin	**SuA9-4**
Mu,Lan	**SuA5-7,MoB3-a-4, SuA9-10**
Muhamad Kamal M Amin	**SuA6-3**
Muto,Nobuyoshi	**SuA1-d-1**

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Nagata,Kouji	**SuA1-c-1**
Nakata,Susumu	**SuA3-7,SuA12-3,SuA12-9,MoB2-3**
Nakayama,Eri	**MoB1-c-8**
Ni,Yongliang	**SuA6-8**
Ningming Nie	**MoB3-a-9**
Nishigaki,Masakatsu	**SuA1-c-2**
Niu,Panfeng	**SuA7-a-4**
Noguchi,So	**MoA13-a-6**
Nojima Taketoshi	**MoA11-10**

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Ojima,Saori	**SuA12-7**
Okawa,Tomohisa	**MoB4-4**

Okumoto,Megumi	**SuA1-c-6**
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Pan,Lefei	**MoB1-d-4**
Pan,Lijun	**SuA2-a-4**
Pang,Fengying	**SuA6-8**
Park,Chanjong	**MoB6-c-10**
Park,Hye-Jin	**MoA13-b-7**
Park,Jiyoung	**MoA13-b-7**
Park,Soo Hyun	**SuA6-2**
Peng,Danhua	**MoB5-1**
Peng,Daogang	**SuA2-a-2**
Peng,Yang	**MoB4-1**
Pham,Hieu	**SuA7-b-7**
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Qi,Baili	**MoB6-c-4**
Qian,Lidong	**SuA10-3,SuA1-b-3**
Qin ,Xiaolin	**MoB1-b-10**
Qiao,Xiaoping	**SuA7-a-6,SuA1-a-6**
Qin,Long	**MoB1-b-2,MoB5-4,**
Qin,Shiming	**MoB2-9**
Qiu,Feng	**MoB5-6**
Qiu,Wenjie	**SuA1-d-4**
Qiu,Xiaogang	**MoB2-2**
Qu,Huiyang	**MoB2-5**
Qu ,Yanqing	**MoB1-c-9**
Quan,Hongyan	**SuA10-4,SuA10-6, SuA2-b-10**
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Ran,Feng	**SuA2-b-8,SuA2-b-9**
Raffin, Bruno	**SuA1-d-9**
Ren,Hongxiang	**MoA11-6**
Ren,Lei	**MoB2-8, SuA9-10**
Ren,Shuang	**MoB4-6**
Ren,Xiaoming	**SuA3-2,MoB6-c-3**
Ren,Yan	**MoB6-a-8**
Ren,Zhang	**SuA2-b-3,MoB1-b-8**
Ren,Zhiyun	**SuA8-3,SuA8-2**
Rodriguez,Ladys	**SuA10-7**
Rong,Qiguo	**MoB4-6,MoB5-5**
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Sakai,Yasuhiko	**SuA1-c-1**
Sakamoto,Naohisa	**SuA1-c-3,SuA1-c-4, SuA1-d-9,SuA12-6,MoB3-b-6**
Sardorbek,Mumino v	**SuA6-2**
Sato,Kenta	**MoB2-3**
Sergienko,Tima	**SuA1-b-8**
Shao,Wei	**SuA12-2,MoB5-7**
Shao,Xingyue	**MoB1-b-8**
Shen,Chao	**SuA7-b-8**
Shen,Guoqin	**SuA4-6**
Shen,Xianhai	**SuA4-8**
Shen,Xuejin	**MoB2-6,MoB1-b-3**
Shen,Yuewei	**SuA5-7,MoB3-a-4**
Shen Yujie	**SuA7-a-8**
Shi Xuecheng	**SuA12-10**
Shi,Liubao	**MoB1-b-8**
Shi,Shaoyong	**MoB6-b-9,MoB6-b-10**
Shi,Xiaohong	**MoB5-1**
Shi,Xiaohong	**MoA11-5**
Shi,Xuecheng	**SuA1-b-3**
Shi,Zhifu	**MoB1-d-4**
Shi ,Weihui	**SuA1-a-9**
Shou,Wenhui	**SuA5-5**
Si,Guangya	**MoB2-1,MoB3-a-1**
Si,Weixin	**SuA10-2, MoA13-a-8**
SONG Jia-yun	**SuA1-c-8**
Song,Jinghua	**MoA13-a-7**
Song,Sang Hae	**SuA12-11**
Song,Tao	**MoB1-c-1**
Song,Wei	**SuA6-4**
Song,Xiao	**SuA1-b-3,SuA10-3,SuA8-2,SuA8-3,MoB6-a-7, SuA12-10,MoB3-b-9**
Song,Yanbo	**MoB6-a-2**
Song,Yang	**SuA2-a-7**
Song,Zhihua	**SuA2-b-1**
Song,Zhiming	**MoB6-b-6**
Su,Wei	**SuA6-1**
Su,Zhong	**SuA7-a-2,SuA7-b-4, SuA4-10**
Sugimotom,Norihiko	**MoB3-b-1**
Sugiyama,Asuka	**SuA12-3**
Sui,Zhijia	**MoB1-c-5**
Sun,Bo	**MoB5-6**
Sun Liyang	**MoA13-b-9**
Sun,Jian	**MoA13-b-3**
Sun,Jian	**SuA1-a-2**
Sun,Mengwei	**SuA1-b-4,SuA4-8**
Sun,Ming	**MoA13-a-1,MoB6-c-8**
Sun,Qinglin	**SuA7-a-4, SuA3-8**
Sun,Wei	**MoB1-c-6**
Sun,Xiao	**SuA5-2**
Sun,Xiaofeng	**MoA11-3**
Sun,Yuhao	**MoA11-3,MoA11-4**
Sun,Yunhao	**MoB4-7**
Suzuki,Hiroki	**SuA1-c-1**
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Takagi,Masahiro	**MoB3-b-1**
Takahashi,YoshiyukiO.	**MoB3-b-1**
Takata,Masami	**SuA1-c-6,MoA13-b-4**
Tan,Bin	**MoB2-7**
Tan,Gary	**SuA1-d-2**
Tan,Wenjun	**SuA10-5**
Tanaka,Satoshi	**SuA3-7,SuA12-3,SuA12-7,SuA12-9,MoB2-3**

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Wu,Guangmin	**MoA14-1**
Wu,Hualei	**SuA2-a-1**
Wu,Huaxing	**SuA1-a-7,MoB6-c-6, MoB3-a-8**
Wu,Maomao	**SuA10-4**
Wu,Sentang	**MoA13-b-3**
Wu ,Wenyuan	**MoB1-b-10**
Wu,Xiaowen	**MoB6-b-8**
Wu,Xuesong	**MoB1-d-7**
Wu,Yingnian	**SuA5-7,MoB3-a-4**
Wu,Yue	**SuA2-a-2**
WU Yun-jie	**SuA1-c-8,MoB6-a-9**
Wu,Zhao	**MoB1-b-5**
Wu,Zhuoqi	**MoB1-c-7**
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Xia,Yongchun	**SuA7-b-5**
Xia,Zhizhen	**MoB1-d-1**
Xiao,Aiguo	**MoB3-b-4**
Xiao,Kaining	**SuA4-6**
Xiao,Tianyuan	**SuA1-c-7,SuA1-d-4 SuA1-b-10,MoB6-a-9**
Xiao,Wei	**SuA1-b-5**
Xie,Chenggang	**MoA11-5**
Xie,Hua	**MoA11-8**
Xie,Jiayu	**SuA1-a-8**
Xie,Jing	**MoB1-a-1**
Xie,Xu	**SuA8-4,SuA9-8**
Xie,Yupeng	**MoB6-a-2,MoB6-a-3**
Xiong,Hailong	**SuA9-5**
Xu,Binjie	**MoB5-3**
Xu,Fuqiang	**MoB1-b-9**
Xu,Guojun	**MoB3-a-7**
Xu,Hong	**MoB6-b-5**
Xu,Jianhua	**SuA3-6,SuA12-4,MoB1-d-3**
Xu,Jinxing	**SuA7-a-6**
Xu,Lifeng	**SuA12-5**
Xu,Liming	**SuA2-a-5**
Xu,Meihua	**SuA1-b-4,SuA4-8,SuA2-b-8,SuA2-b-9**
Xu,Min	**SuA7-b-1**
Xu,Nannan	**SuA1-b-2**
Xu,Shuhong	**SuA12-8**
Xu,Wensheng	**SuA8-6**
Xu,Xiangli	**SuA5-3**
Xu,Xiao	**MoA11-7**
Xu,Yi	**MoB3-a-1**
Xu,Zongchang	**MoB6-b-4**
Xue,Qing	**SuA1-a-2,MoB6-c-3**
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Yamada,Kunihiro	**SuA1-c-2**
Yamamura,Hiroyuki	**MoB2-3**
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Yan,Jie	**MoB5-2,MoB6-a-4**
Yan,Jin	**MoA14-4,MoA14-6,M**

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Yan,Limin	**SuA7-b-3**
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Yan,Xu	**SuA1-d-2**
Yang,Banghua	**MoB4-3**
Yang,Bo	**SuA4-4**
Yang,Chen	**SuA8-5**
Yang,Hongyan	**SuA12-8**
Yang,Huizhen	**SuA1-b-1,SuA3-6,SuA12-4,MoB1-c-2,MoB1-c-3,MoB1-d-3,MoB6-c-5**
Yang,Jiye	**SuA1-d-8**
Yang,Lei	**SuA1-b-6**
Yang,Lu	**SuA1-d-1**
Yang,Mei	**SuA8-4**
Yang,Ming	**SuA4-2,MoA13-a-3, MoA13-a-5,SuA7-b-10**
Yang,Shanliang	**SuA5-1**
Yang,Tao	**MoB5-2,MoB6-a-4**
Yang,Wenqiang	**MoA13-b-5**
Yang,Xiaolong	**MoB1-c-3**
Yang,Yajun	**MoA14-8**
Yang,Yang	**MoB1-d-1**
Yang,Yunbin	**MoA14-3**
Yang,Yuxing	**SuA4-7**
Yang,Zeyao	**SuA2-b-6**
Yang,Zhe	**MoB1-d-8**
Yang,Zhile	**SuA9-3, SuA1-d-10**
Yao,Fanfan	**MoB5-8**
Yao,Yuan	**MoA14-2**
Ye,Jianbin	**SuA12-1,MoB1-b-6**
Yi,Jie	**SuA7-a-7**
Yi,Ok Yeon	**SuA6-2**
Yi,Wenqing	**MoB6-c-9**
Yin,Shiyi	**MoB1-b-4**
Yin,Chenggang	**MoB2-10**
Yin,Yong	**MoA11-2,MoA11-3,MoA11-4,MoA11-6**
Yonezawa,Tomoko	**SuA1-c-6,MoA13-b-4**
Yoshii,Naoko	**MoA13-b-4**
Yu,Chao	**SuA9-2**
Yu,Jia	**SuA2-a-7**
Yu,Sijiao	**SuA10-2**
Yu,Yajing	**SuA7-a-2**
Yu,Zhibin	**MoB6-a-1**
Yu Zhenglin	**SuA6-10**
Yuan,Jing	**MoA13-b-2**
Yuan,Kai	**MoB1-d-9,MoB1-d-10**
Yuan,Zhiyong	**SuA10-2, MoA13-a-8**
Yue,Xin	**SuA2-b-6**
Yue,Yazhou	**MoB1-c-5**
Yun,Nam Yeol	**SuA6-2**
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Zan,Peng	**SuA6-5,MoB4-9**
Zeng,Chunping	**MoA14-1**
Zeng,Jiayou	**MoB6-a-3**
Zeng,Weimin	**MoB5-4**
Zeng,Yan	**MoB1-d-7**
Zeng,Yanyang	**SuA12-4**
Zhan,Jie	**SuA6-8**
Zhang,Chi	**SuA1-c-4,MoB3-b-6**
Zhang,Cong	**MoA11-5**
Zhang,Fa	**SuA5-4**
Zhang,Faguang	**SuA8-5**
Zhang,Fang	**MoB2-1**
Zhang,Guohua	**MoB1-d-9**
Zhang,Haiguang	**SuA1-b-2**
Zhang,Hao	**SuA2-a-2**
Zhang,Hesheng	**SuA1-a-6,SuA7-a-6**
Zhang,Huaiyu	**MoA14-3**
Zhang,Jianchun	**SuA1-a-7**
Zhang Jihua	**SuA6-10**
Zhang,Jing	**SuA5-2**
Zhang,Jinzhan	**MoB3-b-8**
Zhang,Lei	**SuA7-a-1**
Zhang,Li	**SuA2-b-5**
Zhang,Lin	**SuA5-7,SuA1-b-9,SuA8-3,MoB3-a-7,MoB2-7,MoB3-a-4, SuA9-10**
Zhang,Linxuan	**SuA1-c-7**
Zhang,Mingzhi	**MoB2-4**
Zhang,Ning	**SuA1-b-6**
Zhang,Peng	**MoB2-2**
Zhang,Ping	**MoA13-a-2**
Zhang,Qing	**SuA3-1**
Zhang Qing-bin	**SuA2-a-8**
Zhang,Shaohua	**MoB3-a-3,MoB1-a-7, MoB3-a-5**
Zhang,Shaoning	**SuA1-d-6**
Zhang,Shaoyun	**SuA8-2,SuA1-b-3,SuA8-3, SuA12-10**
Zhang,Shen	**SuA4-1**
Zhang,Shengxiao	**MoB6-b-6**
Zhang,Shuli	**MoA13-b-8**
Zhang,Suqin	**MoB4-9**
Zhang,Wei	**SuA7-b-6**
Zhang Wulong	**MoB6-a-9**
Zhang,Xiong	**MoB3-a-6**
Zhang,Xuliang	**SuA4-8**
Zhang,Yabin	**SuA8-1**
Zhang,Yanan	**SuA6-4**
Zhang,Yingchao	**SuA5-2**
Zhang,Yongbo	**SuA2-b-6**
Zhang,Yongliang	**MoB1-d-6**
Zhang,Yongtao	**SuA5-6**
Zhang,Yuxin	**SuA6-9**
Zhang,Zhaoyu	**SuA1-d-4**
Zhang,Zheng	**MoB1-a-1**
Zhang,Zhi	**MoB5-9**
Zhang,Zhili	**MoA13-b-2**
Zhang,Zhuangya	**SuA1-b-2**
Zhao,Chen	**MoB3-a-3,MoB3-a-5**
Zhao,Dinghai	**SuA12-2,MoB5-7**
Zhao,Dong	**MoB1-a-4**
Zhao,Jian	**MoB4-2**
Zhao,Jianhui	**SuA10-2, MoA13-a-8**
Zhao,Jianxun	**SuA1-a-3**
Zhao,Juanjuan	**MoB4-8**
Zhao,Jun	**MoB2-7**
Zhao,Kun	**SuA1-c-3,SuA12-6,SuA1-d-9**
Zhao,Meng	**MoA11-6**
Zhao,Qiaoxia	**SuA5-4**
Zhao,Xilu	**MoB1-d-1,MoB1-d-2**
Zhao,Xinjun	**SuA1-a-4,MoB6-c-4**
Zhao,Xinye	**SuA5-1**
Zhao,Xu	**SuA7-b-4, SuA4-10**
Zhao,Yongjia	**SuA3-2**
Zhao,Yun	**MoB6-b-4**
Zhao,Yuwei	**SuA1-d-9,MoA14-7**
Zheng,Anbing	**MoB4-7**
Zheng,Changwei	**MoB6-c-3**
Zheng,Lanchao	**SuA9-6**
Zheng,Min	**SuA1-b-5**
Zheng,Zhiqiang	**MoB1-b-6**
ZhengYicheng	**SuA1-a-8**
Zhou,Daizhong	**MoB1-d-4**
Zhou,Diqing	**MoB3-b-7,MoB3-a-2**
Zhou,Fang	**SuA2-b-4**
Zhou,Haipan	**MoA14-1**
Zhou,Lili	**SuA1-d-7**
Zhou,Ning	**SuA4-6**
Zhou,Qin	**SuA3-2**
Zhou,Wenju	**SuA2-b-2,MoB4-10**
Zhou,Xiaobing	**SuA2-b-2,MoB4-10**
Zhu,Bin	**MoB6-a-1**
Zhu,Chengzhu	**MoB4-7**
Zhu,Haiyang	**MoB5-6**
Zhu,Lei	**SuA7-b-3**
Zhu,Lixin	**SuA1-c-5**
Zhu,Wenhai	**SuA6-7**
Zhu,Wenhua	**SuA1-a-5**
Zhu,Xiaojin	**SuA1-a-6,SuA7-a-6, MoB1-c-6,MoB4-9**
Zhu,Zhen	**MoB6-b-7**
Zhu,Zhongxian	**MoA11-2**
Zhuang,Han	**SuA10-6**
Zou,Yongxian	**MoB6-c-4**