Editorial

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Biographical notes: Hong-bin Deng is an Associate Professor and Master Tutor in Media Computing and Intelligent System Lab at Beijing Institute of Technology. From the year 1993.9 to 2000.3, he was granted by Beijing Institute of Technology the Bachelor's degree and Master's degree in Electronics Mechanic Engineering. He then continued to be a Teacher there since the year 2000.3 and took his PhD in Computer Science. His main research areas cover media computing, information processing, artificial intelligence, robotics, system identification and analysis, etc. He also takes charge of nearly eight research projects, and has funded more than five million RMB for the projects since the year 2000. Some projects come from Chinese national Hi-tech Research and Development Program from Ministry of Science and Technology. In addition, he has published one technical book (more than 100,000 Chinese characters), one translation book (more than 400,000 Chinese characters), and about 20 papers in both domestic and foreign journals, and most of them are indexed by EI.

Daisheng Luo is Professor of Electronics and Information at Sichuan University, where he carries out research in signal and information processing, communication and information system, image processing and pattern recognition, computer vision, intelligent information processing and system design, and biomedical image analysis. He has fulfilled nearly ten research projects, and been funded more than million RMB for the projects. He took his first degree at Sichuan University, a PhD and a post-doctorate at University of Glasgow, Glasgow, UK. He is a Senior Member of Chinese Institute of Electronics, and an Associate Editor of *Journal of Information and Electronic Engineering*.

Qingchuan Tao is an Associate Professor and Master Tutor in pattern recognition field at Sichuan University. From the year 1993.9 to 2000.7, he was granted by Sichuan University the Bachelor's degree in Electronics and Master's degree in Pattern Recognition. He then continued to be a teacher there since the year 2000.7 and took his PhD in Optics in 2005. His research field mainly covers image processing, pattern recognition, information optics and biomedical image analysis, etc. He also has taken part in many important research projects, including 3D medical image processing, laser scanning confocal microscopy 3D biomedical image processing and recognition, optical sectioning microscopy 3D imaging technique, face recognition, gait recognition, fingerprint recognition, car plate recognition, intelligence transport system, rock core scanning imaging, etc. In addition, he has published more than 30 papers in both domestic and foreign journals, and ten of them are indexed by SCI and EI.

Media, in general, refers to the information, such as sounds, audios, images, videos and movies. It involves in communication, remote monitoring and controlling, TV conferencing, etc. Media computation is a kind of computer media processing. It takes the individual pixels of a 2D image or a 3D image or a video image, or the individual bytes of a sound or an audio stream, and manipulates them, using mathematical computation and computer programming, to produce new or modified images or sounds. There are a variety of approaches of media computation. In mathematical computation, they may include restoration, enhancement, transformation, compression, representation, feature extraction, pattern recognition, system modelling, modulation, coding, encryption, and so on. In computer programming, they may use various computer languages, for instance, Fortran,

C/C++, and Java. Recently, Python is a common programming environment implemented in C. A developed version of Python is Jython which is implemented in Java.

Media computation is one of the ways to learn computer science. Digital media is manipulated with software, such as Photoshop, ACDSee, CorelDRAW, and 3DMax. Media computation can help software engineers understand how the programs work, learn how to transfer media from one program to another, and study how to design new programs. It can also help users of media understand how to manipulate media, to know what is real and what could be just a trick.

System modelling is a research field that is closely related to media computation. A system may be composed of software components, hardware components, or both software and hardware components. System modelling is a technique, which is used to express, visualise, analyse, and transform the architecture of a system. It can assist to design different systems to meet different requirements and to develop and maintain large systems in the construction phase. It can also increase the reliabilities and reduce the development costs of systems by making it easier to build a system, to reuse the previous built components in a new system, to change a system according to requirements. System modelling can ensure to develop system software in a consistent manner and to integrate software components in a simple way.

In system modelling, a conceptual framework, language, textual notations and diagrammatic notations are needed. The notations in general include such as tables, prose, graphs, symbols, and numbers. There are four main conceptual frameworks: design methods, module interconnection languages (MILs), software architectures, and design patterns. Since the early 1970s, design methods focus on program language modules. By the late 1980s, object oriented system modelling was employed. The first MIL occurred in 1975, thereafter, several different MILs were developed. Software architectures and design patterns are more recently proposed and put into use.

The theories and technologies of media computation and system modelling, as the latest research hot spot, are used almost in every field. In social science, they can be applied to finance managements, banking services, stock market, population statistics, manpower resources, politics, economics, etc. In natural science, they can be applied to electronics, communications, automatic control, artificial intelligence, physics, chemistry, etc. In medicine and life science, they can be used in medicine, biomedicine, bioinformatics, biomedical information processing, medical diagnosis and operations, etc.

In total, 28 papers have been selected to reflect the thematic vision. We believe that the series of works in this special issue can serve a useful reference for understanding the theories and technologies of media computation and system modelling scientifically. The contents of these studies are briefly described as follows.

According to the investigation of the simulation design of unmanned helicopter with MATLAB, and completes the development of modelling, control system, navigation system, device input system and virtual reality system, this paper, 'Simulation system design of a small-scale unmanned helicopter', eventually accomplishes the simulation system which can alternate between manned mode and unmanned mode freely, and leads to helpful guidance for the development of real helicopter control systems.

This paper, 'Modelling and control system design of a small-scale unmanned helicopter', employs a time domain system identification method to get the helicopter attitude transfer function and then applies a nested PID method to design the helicopter flight control system based on the identified parameters. Experimental results show that the identified model is very accurate and the system designed based on our model can manipulate the attitude and position of a helicopter quite well.

This paper, 'Robust controller design of small-scale unmanned helicopter', applies the technique of robust control loop shaping in the design of unmanned-vehicle control system. This paper builds up the structure of the controller according to our small-scale unmanned helicopter platform, design the controller with H_∞ loop shaping approach and implement the velocity controls of the helicopter in two directions. The simulation demonstrates the controller have good control effect.

In this paper, 'A quick moving target detection method based on real-time airborne videos', a fast detection method of moving target from real-time airborne videos is presented. This paper first utilises the global motion vector estimation to estimate the background movement and then uses binocular interpolation for motion compensation. In this way, the target detection in dynamic airborne videos is converted into detection in static backgrounds. A method by multiplying the difference of the symmetrical images among three adjacent frames is adopted subsequently to enhance the target and increase the difference between the target and background noises. Finally, the region growth and morphological image processing techniques are employed to realise target segmentation. Experimental results demonstrate the effectiveness and robustness of our algorithm.

In this paper, 'Time-dependent pheromones and electric-field model: a new ACO algorithm for dynamic traffic routing', a new ant colony optimisation (ACO) algorithm based on time-dependent pheromones and electric-field model is presented to solve the dynamic traffic routing problem. The main objective of this work is to search out the least-time-cost route in a variable-edge-weight graph. These both improvements help our algorithm yield the optimal route that can effectively avoid the congestion areas and cost least time to reach the desired destination.

In this paper, 'Human action recognition from silhouettes using manifold learning and MDA', a method for human action recognition based on silhouette observations is presented. A miniature stereo vision machine is employed to generate high-resolution dense depth maps at video rate, and the silhouettes of a moving

person are extracted as the input features through fusing colour and depth information. The methodology supervises NPE to seek a projection that best represents the silhouette sequences in the low-dimensional latent space, employs MDA to find a transformation matrix that best separates the action features, and combine both to discriminate the predefined actions.

This paper, 'An adaptive immune algorithm based on the endocrine regulation mechanism for scheduling problems of flow shop with zero wait', proposed an approach that leads to an original adaptive endocrine and immune algorithm (EIA) approach based on regulation laws of hormone in the endocrine system to the flow shop scheduling with zero wait restrictions. An accelerating mechanism and a restraining mechanism are also integrated into the EIA approach to promote the search for global optimal solutions. This paper first gives the formulation of the flow shop problem with zero wait, thus establishing the mathematical model of the problem. Then begins with an overview of the immune algorithm, reviews the development of the artificial endocrine system, reveals the close relationship of mutual modulation between the endocrine system and the immune system, explains the regulation laws of hormone in the endocrine system and describes the details of the EIA approach. At last presents a case study, which is employed to illustrate the performance of the approach in comparison with that of both the standard immune algorithm and the improved immune algorithm. The experimental results indicate the EIA compares favourably to the standard immune algorithm and the improved immune algorithm with respect to the search precision and the convergence rate, thus demonstrating the feasibility, originality and excellence of the EIA approach.

In this paper, 'Fuzzy system identification based on support vector regression and genetic algorithm', a new fuzzy identification approach based on support vector regression and GA has been presented. Firstly positive definite reference function is utilised to construct a qualified Mercer kernel for SVR. Then an improved GA is developed for parameters selection of SVR, in which the number of support vectors and regression accuracy are regarded simultaneously to guarantee the conciseness of the constructed fuzzy model. Finally, a set of TS fuzzy rules can be extracted from the SVR directly.

This paper, 'Nonlinear modelling of drum-boiler-turbine unit using an evolving Takagi–Sugeno fuzzy model', deals with nonlinear modelling of a drum-type boiler-turbine unit (BTU) using an evolving Takagi–Sugeno (T–S) fuzzy model. It is well known that the BTU is a highly nonlinear, multivariable, and time-varying system. The normal linear or quasi-linear modelling can not reflect the real nonlinear characteristics of the BTU, degrading control precision and operating performance. A novel method based on fuzzy clustering, least-squares, and genetic algorithms (GA) is proposed to construct a 'parsimonious' dynamic T–S fuzzy model with high generalisation ability. In this method, a self-organising fuzzy model generation strategy based on GA is proposed for selecting the optimal structure

(including the number of rules and input variables) and antecedent parameters of the fuzzy model. Furthermore, the modified Akaike information criterion is introduced as the evaluation function of GA, which enables the self-organising strategy to choose an optimal fuzzy model with a good trade-off between fitting the training data and keeping the model simple. The advantage of the proposed evolving fuzzy model identification method is that the selection of rules, input variables and antecedent parameters can be achieved automatically. With the objective to achieve a good trade-off between the accuracy and the complexity of the fuzzy model, the obtained T–S fuzzy model will have compact number of rules and input variables with high accuracy and generalisation ability.

The paper, 'An improved multi-objective particle swarm optimisation algorithm', tries to solve warship course optimisation problem by an improved multi-objective (MO) particle swarm intelligence optimisation algorithm. By analysing the particularity of military navigation, the paper has proposed the model of warship course optimisation problem in island region basing on multi-objective optimisation. Analysing the pluses and minuses of several kinds of multi-objective particle swarm optimisation algorithms at present, aiming at the deficiencies of these algorithms, the paper has proposed a pre-emption multi-objective particle swarm optimisation algorithm (PMOPSO) for warship course optimisation problem. Adopt compared method to update local optimum Pi. At the same time, propose the method based on pre-emption strategy, maintaining the colony variety strongly. Lastly, adopt the method of infeasibility degree to deal with multi-obligation.

As the manoeuvrability of the aerial target is increasing, it requires high mobility of the aerial vehicle when dealing with it, especially when fights are at a short distance. The gyration radius of the vehicle should be as little as possible, correspondingly, the lateral acceleration which the aerial vehicle bears is obviously increasing and the negative effect to the safety distance is also increasing clearly, which will lead to the flying environment of low axial acceleration and high lateral acceleration. Thus, under this working environment, this paper, 'Studies of the working characters of the aerial vehicle's safety control system', has proposed a computer synthesis simulation of aerial vehicle safety control system which is made by using a working model simulating software and an unturned runaway escapement driven by two rotors. The research results have shown that the safety system can determine lateral acceleration effect.

Coherency technology is very important to fault analysis and construction interpretation. But there exists a problem in traditional algorithm of coherence cube which consists of C1, C2 and C3 algorithm, that is, there is huge amount of computation and the algorithm is too complex to run. This paper, 'Study and realisation of a fast building algorithm of coherence cube', has defined two concepts, signal matching distance and wave similarity coefficient, and has presented their way of calculation and the relevant algorithm. By means of experiments, compared with the traditional algorithm, 'C1' algorithm, the two algorithms are similar in

the ability of fault recognition. Meanwhile the new algorithm is much faster.

As a kind of symbols, logo is a special symbol with the unique mark. So the logo recognition is an effective way to tell us where the document come from and express the semantic information of the document. This paper, 'Logo recognition based on membership degree and clossness degree of fuzzy sets', presents the work in the field of logo recognition by using fuzzy sets theory. Aim at the application requirement of logo recognition in image intelligent processing, a logo recognition algorithm based on membership degree and clossness degree of fuzzy sets is proposed. By fuzzy mapping, the logo's gridding feature is transformed to the membership degree of fuzzy sets. Then using clossness degree and closest principle of fuzzy sets to accomplish logo recognition.

This paper, 'Robust and automatic segmentation of a class of fuzzy edge images', has proposed a novel segmentation algorithm to automatically and robustly separate the object in a class images which consist of a background region, a fuzzy/blurry edge region, and an object region. In this class of images, the greyness gradually changes from the background region to the object region. The algorithm is characterised by the double-thresholding and probability based fuzzy segmentation and the maximum slope principle based estimation of the thresholds.

This paper, 'Pharmaceutical crystal shape control based on online image processing and multi-scale modelling', reviews recent developments in online crystal morphology measurement and control using online imaging and image analysis. The online images were analysed using a multi-scale image analysis method to extract the crystals from the image background. The paper also reviewed recent developments in morphological population balance (PB) modelling which can provide the evolution of the shape and distributions of sizes in all crystal face directions in a reactor. Finally, the perspectives for automatic morphology control which require integration of crystal morphology prediction, morphological PB modelling, online 3D imaging and image analysis for shape characterisation as well as computational fluid dynamics are outlined.

This paper, 'Inductive data mining: automatic generation of decision trees from data for QSAR modelling and process historical data analysis', has proposed an inductive data mining approach for automatic generation of decision trees from data (GPTree) which can overcome the limitations of greedy search based methods. In addition, the approach is extended to a new method (YAdapt) that models the original continuous endpoint by adaptively finding suitable ranges to describe the endpoints during the tree induction process, removing the need for discretisation prior to tree induction and allowing the ordinal nature of the endpoint to be taken into account in the models built. A strategy for further improving the predictive performance for previously unseen data is investigated that uses multiple decisions trees, i.e. a decision forest, and a majority voting strategy to give predictions (GPForest). The methods were applied to quantitative structure activity relationships (QSAR) modelling for eco-toxicity prediction of chemicals and to the analysis of a historical database for a wastewater treatment plant.

In this paper, 'Intelligent animal fibre classification with artificial neural networks', images of cashmere and fine wool fibre are processed and four main parameters described the scale pattern are extracted from their skeletonised binary image only having one pixel wide and showing only fibre and scale edge details. The colour light microscope images of fibre captured by CCD camera are transformed into the skeletonised binary images. Then four basic shape parameters of fibre scale are measured and a database composed of numerical data of four comparable indexes, which are fibre diameter, scale interval, normalised scale perimeter and normalised scale area, is established. An LVQ neural network classification model, including four input nodes, 16 hidden nodes and two output nodes, are developed on the basis of comparable indexes is used to classify two kinds of animal fibres: cashmere and fine wool. The simulation testing results show the model can distinguish cashmere from fine wool effectively.

According to the current status of information search, this paper, 'Intelligent personalised information retrieval system based on multi-agent', combines traditional retrieving technology and agent technology, propose an intelligent multi-agent personalised information retrieval system. A personalised information model must specialise to current interests of the user and adapt as they change over time. Machine learning techniques are used to increase the agents' capabilities of learning from the experience of previously satisfied queries. Model's architecture and work principle have been analysed and solution to system's critical problems have been given. Furthermore, the system can learn to fit for different users' manners and need to satisfy the individualised need. In addition, the mechanisms of cooperation and communication between agents need improving.

In the wireless sensor network (WSN), the coverage problems have received increased attention recently. This paper, 'Immune clonal selection algorithm for target coverage of wireless sensor networks', has proposed the scheduling model for the point coverage problem for WSN, through adjustable the sensing range. The problem is to determine maximum network lifetime when all points are covered and sensor energy resource are constrained. This paper has used the immune clonal selection algorithm method to extend the sensor network operational time by organising the sensors into a maximal number of adjustable range set covers that are activated successively. Only the sensors from the current active set are responsible for monitoring all targets and for transmitting the collected data, while nodes from all other sets are in a low-energy sleep mode.

Trust is an important tool in human life to cope with the uncertainty caused by the free will of others. Uncertainty and uncontrollability are also important issues in peer-to-peer (P2P) environments. A computational model of trust and its implementation can alleviate this problem. This

paper, 'A pyramidal trust computing model for peer-to-peer networks inspired from social network', has proposed a novel approach and a connection management protocol against malicious peers in unstructured P2P networks. This approach is based on dynamically adapting P2P network topology via pyramidal trust management (PTM) model to promote contribution in the network. The PTM model manages the connections among peers based on the amount of contributions by peers. PTM has low overhead to run, fully complies with the concepts and protocols of unstructured P2P networks, and is decentralised so as to operate efficiently.

This paper, 'Healthcare information system: building a cyber database for educated decision making', has proposed a healthcare information system, namely Health Database Information System (HDIS) is a medical information system for educated decision making which it aims to provide healthcare/medical information to a wide range of users from public at large, doctors to healthcare planners. HDIS combined the various information technologies such as the internet, data warehousing and decision support systems. HDIS focus on providing healthcare personnel, patients and caretakers with information when they need it and where they need it so that they can make educated decisions.

This paper, 'Modelling and analyses of WSN-based pursuit-evasion strategies for multi-pursuers to multi-evaders', has proposed several novel pursuit-evasion policies for the efficiency of capture and evasion of pursuers and evaders in pursuit-evasion games. The vector-ward evasion strategy may bring the evader breaking away from the puzzledom between two fires and reduce fluctuation of evasion routes. The intelligent collaboration pursuit strategy effectively exerts the collaboration efficiency of multiple pursuers and shortens the capture time. The estimated location errors caused by wireless sensor networks were also involved for the pursuers and evaders in the simulation of this study. The results show that every pursuit-evasion strategy is valid and robust. In the simulation of multiple pursuers to capture multiple evaders, the object assignment method and the corresponding pursuit policies are reliable and can capture all evaders in a limited area as quickly as possible.

This paper, 'Dynamic modelling of the laser tracking gimbal used in a laser tracking system', has proposed the dynamic modelling of the tracking gimbals used in a laser tracking system (LTS). Laser tracking systems are one of the most powerful measurement tools and have been widely used in the robot calibration. This paper first gives us an overview of the LTSs, then provides a detailed discussion and derivation of the dynamic model for an ideal tracking gimbal used in a LTS and presents a set of simplified motion equations for the complete dynamic model derived. Finally develops a complete dynamic model of the tracking gimbal used in a LTS which uses the Lagrange-Euler equations of motion.

This paper, 'Error analysis of robot detecting system with laser sensors in unknown environment', has presented a new detecting method of unknown and unstructured environment with laser sensors. The detecting system model of robots is set up and the theoretical analysis is also made, which shows that the detecting error of the detecting system based on the laser sensor mainly comes from the laser rangefinder measure error caused by itself, the error related with the detected environment surface, the error caused by the dynamic measurement and the error caused by the outside environment. Strategies of error modification and mathematic modification formulas are pointed out at different sources of error in the paper which lays the foundation of further researching the precise control methods of robot in variety under the unstructured environment.

In this paper, 'Sliding mode variable structure control of mobile manipulators', the sliding mode variable structure control is employed to the trajectory tracking control for the mobile manipulator. The entire control system is composed of two parts, including the sliding mode trajectory tracking control of the mobile platform and the non-singular terminal sliding mode control of the manipulator. The simulation results show the effectiveness of the presented approach.

This paper, 'On the control of the liquid pouring process using cooperative manipulators', presents a two stage control design scheme for position and force control of a robotically manipulated pouring process. The robotic system comprises two cooperative manipulators. A simplified model of the robotically controlled pouring process is derived, considering that the liquid's motion is approximated by a pendulum type model. The forces space is decomposed to moving and controllable forces which are responsible for the motion of the tank and the controllable forces, which may be controlled through the proposed control law. The control scheme comprises a nonlinear inverse dynamic controller, which is designed ignoring liquid sloshing, and a multivariable PID controller, which is used to improve the closed-loop performance with respect to steady state positioning errors and sloshing suppression.

This paper, 'Real-time compensation control for hysteresis and creep in IPMC actuators', presents a new combined complex operator which is used for modelling of systems with hysteresis and creep. Because hysteresis and creep hinder the effective use of ionic polymer-metal composite (IPMC) in sensors and actuators, this paper presents a hybrid model of hysteresis and creep in piezoelectric actuator, which is constructed by Preisach operator and creep operator. Then, the corresponding inverse models for both hysteresis and creep are developed. Based on the obtained inverse model, a method for real-time compensation of the hysteresis and creep of piezoelectric actuator is applied to the control of system nonlinearities.

In conclusion, these papers are of high academic value and represent the latest trend in this research field. We feel that they not only give a clear indication of the present state of play but also point to a promising future for related research study.