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SPECIAL ISSUE ON NETWORKING, SENSING AND CONTROL

Mingcong Deng[1]

Department of Systems Engineering
Okayama University
3-1-1, Tsushimanaka, Kita-Ku, Okayama 700-8530, Japan
deng@suri.sys.okayama-u.ac.jp

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Welcome to the special issue composed of selected papers from the *2009 IEEE International Conference on Networking, Sensing and Control*. This international conference, sponsored by the IEEE Systems, Man, and Cybernetics Society, was held at Okayama University, 26-29 March, 2009, where there were 173 papers presented attracting over 150 participants from all over the world. From this conference, twelve technical contributions of high quality on control theory and application are selected into this special issue. The main contents of the papers are briefly described as follows.

The paper 'Neuro Based Classification of Facility Sounds with Background Noises' by Shibata et al., studies the recognition of various facility sounds with background noises and the realization of the preventive maintenance of pipelines. Gas leakage simulator used to generate gas leakage sounds are made for various crack sizes and pressures. Sounds of 9 facilities in the plant are recorded and the recorded sounds of facilities are preprocessed by applying Fast Fourier Transformation. The features of sounds are extracted and classified by a Neural Network.

The paper by Behdani et al., entitled 'Agent-Based Modeling to Support Operations Management in a Multi-Plant Enterprise' demonstrates how an agent-based model can be used to evaluate the dynamic behavior of a global enterprise, considering both the system-level performance as well as the components' behavior. Such quantitative model can be very useful for predicting the effects of local and operational activities on plant performance and improving the tactical and strategic decision-making at the enterprise level.

The work, '3D Path Planning for Mobile Robots Using Simulated Annealing Neural Network' by Kroumov et al., presents a highly efficient potential field based 3D path planning technique for mobile robots, moving in known environment. The path planner is based on direct description of the obstacles by simulated annealing neural networks. The generated paths are piecewise linear with changing directions at the corners of the obstacles. The proposed planner can be successfully applied to snake robots, flying robots, and control of Gantry cranes. Several simulation results show the effectiveness of the proposed algorithm.

In the paper 'Adaptive PID Control for Nonlinear Systems with a Parallel Feedforward Compensator', by Mizumoto et al., a design method of an adaptive PID controller based on output feedback for nonlinear systems with a higher order relative degree and disturbances is proposed. To realize an adaptive PID control system, a PFC for a nonlinear system which does not meet OFEP (Output Feedback Exponentially Passive) conditions

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is introduced and an adaptive feedforward input with a structure of RBF (Radial Basis Function) neural networks in order to remove the steady-state bias error from the PFC output is designed. The proposed method has a structure of two degree of freedom and can design a robust adaptive PID control system with higher accuracy on tracking control.

The paper by Liang et al. entitled 'Stability of Zeros of Discrete-Time Multivariable Systems with GSHF' is concerned with the stability of zeros of the discrete-time multivariable system composed of a generalized sample hold function (GSHF), a continuous-time plant with the degrees of infinite elementary divisors being two or three, and a sampler in cascade. The properties of the limiting zeros are studied and the conditions for ensuring the stability of the limiting zeros of the discrete-time systems for sufficiently small sampling periods are derived.

The work 'A Fictitious Reference Iterative Tuning Method with Simultaneous Delay Parameter Tuning of the Reference Model' by Masuda et al., proposes a modified Fictitious reference iterative tuning (FRIT) method which simultaneously tunes the delay parameter of the reference model. Since the proposed method adjusts the rise time of the reference model output by tuning the delay parameter, it can avoid the difficulty of selecting the inappropriate reference model. The paper also extends the analytical pre-filter for the one-shot experimental input-output data in the conventional FRIT to the case of the proposed FRIT with simultaneous delay parameter tuning of the reference model.

The paper by Shiu entitled 'The Robot Deployment Scheme for Wireless Sensor Networks in the Concave Region' provides a sensor deployment scheme to deploy sensors on the monitor area for wireless sensor networks and to achieve efficient coverage. The robot deployment scheme is proposed. A single robot deploys sensor one by one according to the decided x and y coordinates, and the first deployed sensor and the last deployed sensor are neighbor. The scheme can be applied to the deployed area with concave boundaries. Once entering the concave region, the robot can deploy sensor efficiently with full coverage, and then leave the concave region from the Exit which is next to the Entry.

While the work 'Hierarchical Network-Based Safety Assessment Decision Support System for Thermal Power Plants' by Yang and Zhang presents a new approach to develop a safety assessment decision support system (SADSS). Based on investigation on inference engine and the design method of knowledge base, how to set up SADSS for thermal power plant based on hierarchical network is introduced. By introducing decision support system to safety assessment of power production process for power plant, it assists appraisers in making decisions and make the safety assessment process for thermal power plants systematization and automation.

In the paper 'Vibration Control of a Flexible Arm Experimental System with Hysteresis of Piezoelectric Actuator' by Saito et al., an operator-based nonlinear vibration control of a flexible arm experimental system using piezoelectric actuator with hysteresis is designed, where hysteresis is described by Prandtl-Ishlinskii (PI) model. In order to compensate the hysteretic effects, based on the concept of Lipschiz operators and robust right coprime factorization, nonlinear vibration controllers are proposed to the experimental system. Furthermore, a tracking operator design method is presented to ensure the tracking performance of the considered system.

In the work 'Tracking Control of a Two-Link Planar Manipulator Using Nonlinear Model Predictive Control' by Henmi et al., a tracking controller for a two-link planar manipulator on the horizontal space via nonlinear model predictive control (NMPC) is designed. In order to guarantee a desired tracking performance, a time-variable time-coefficient of the reference trajectory is used in the proposed controller instead of using a time-constant. The time-coefficient is tuned based on a control error between a controlled variable and a desired value.

The paper by Tseng et al., entitled 'A DSP-Based Lane Recognition Method for the Lane Departure Warning System of Smart Vehicles' describes a lane recognition method for the lane departure warning system of smart vehicles and an algorithm implemented in a dual core ADI-BF561 600MHz DSP embedded system to verify the functionality. The applied median filter can obtain the median element of a 4-by-3 array using only 19 comparison operations. Furthermore, the edge enhancing filter can washout the foreign objects in the region of interest and keep the lane marks with tilt/slope pattern. Using these two tools, the applied algorithm can detect the event of lane-departure and alarm the warning to assist drivers for driving safety on the road. Also, the lane mark enhancement is implemented to improve the accuracy of detection, and double-line detection is also added to alert the driver for eventual traffic rule violation.

The work 'A Soft-Switching Technique for Novel ZVT-PWM Inverters' by Ming, proposes a novel Direct Current (DC)-Rail Parallel Resonant Zero Voltage Transition (ZVT) Voltage-Source Pulse Width Modulated (PWM) Inverter for three-phase motor drives. Compared with traditional soft-switching inverters, the new control scheme is simpler and less dependent on the load current, and imposes less requirements on power ratings of the resonant components and auxiliary switches. This work solves the unbalancing problem of neutral-point voltage with light load in the proposed inverter by analyzing its generation principle and impacts on a soft-switching circuit. Compared with the hardware switching circuit, when the power of the inverter becomes higher, the power loss of the proposed soft-switching circuit is greatly reduced with significantly improved efficiency.

We would like to thank all the authors for their contributions to this special issue. We believe that the twelve papers presented in this special issue are representative of some of the recent advances on Network, Computing, Information and Control. We would also like to thank the reviewers for their help in evaluating the papers. Finally, we are grateful to Prof. Yan Shi, Exective Editor of IJICIC, for providing us the opportunity to organise this special issue, and his timely advice during this process.

Biographical Notes. Prof. Mingcong Deng was born in 1964. He received his BSc and MSc degrees in Control Engineering from Northeastern University, China, in 1986 and 1991 respectively, and his PhD degree in Systems Science from Kumamoto University, Japan, in 1997. From 1997 to 2000 he was with Kumamoto University as an assistant professor. From 2000 to 2001 he was with University of Exeter, UK, and then spent one year at the NTT Communication Science Laboratories for human arm dynamics research. Since late 2002, he has been with the Department of Systems Engineering, Okayama University, where he is an associate professor.

Prof. Deng is a member of SICE, IEICE, JSME, ICROS and the IEEE (SM). He serves as Editor-in-Chief of International Journal of Advanced Mechatronic Systems and associate editors of some international journals. His research interests include living body measurement, operator-based nonlinear system modeling, control and fault detection, strong stability-based control, and robust parallel compensation.