Foreword and Editorial

International Journal of Control and Automation

We are very happy to publish this issue of an International Journal of Control and Automation by Science and Engineering Research Society.

This issue contains 39 articles. Achieving such a high quality of papers would have been impossible without the huge work that was undertaken by the Editorial Board members and External Reviewers. We take this opportunity to thank them for their great support and cooperation.

The paper “Efficiency Optimization Control for Three-Phase Induction Motors with Hall Sensor” develops efficiency optimization control strategies for three phase induction motors with Hall sensor. This thesis compares the different control strategies include open-loop voltage-mode control of hard-commutation scheme, open-loop voltage-mode control of soft-commutation scheme, and closed-loop current-mode control scheme, and analyzes the current response and overall efficiency. This thesis also develops a low-cost and high efficiency sensorless control for three phase induction motors drives.

In the paper “Autonomous Flight of Unmanned Aerial Vehicle (UAV) by using Linear Quadratic Regulator (LQR)”, the linear quadratic regulator based autopilot is premeditated for level flight of unmanned aerial vehicle (UAV) which has been achieved lucratively. Diverse modes are utilized for controlling the rates of UAV. The pitch rate is controlled by utilizing the phugoid mode, the roll rate is controlled by utilizing the roll mode and the spiral mode is utilized for yaw rate. The linear quadratic regulator proposes sturdiness at the rate of accomplishment to subjugation over the turbulences and instabilities in order to conquer the favored performance.

Paper “Hardware/Software Partitioning Based on Hybrid Genetic and Tabu Search in the Dynamically Reconfigurable System” proposes a hardware/software partitioning algorithm which can be applied to the dynamically reconfigurable system. Firstly, based on reconfigurable system structure, this paper brings forward a kind of system model and its task description, then use genetic/tabu search (GATS) integration strategy, in the condition of resource constrain of the reconfigurable systems, specific applications will be mapped to software and hardware platform. Secondly, using configuration prefetching and scheduling strategy it will be found out that the shortest time assignment and the execution order of the entire task flow diagram in the partition result.

The research paper entitled “Numerical Simulation for Reducing the Flood Damage of Green Park Using MIKE URBAN” performed numerical analysis according to change of coefficient of runoff considering underground rainfall storage in surrounding parks and facilities to reduce non-point source pollutants. Use of rainfall retention facility to improve urban flooding reduced peak flow and effectively prevented flooding in the subject areas.

The paper “Optimization of Sensor Structural Parameters and Image Reconstruction for Electrical Capacitance Tomography” proposed a structural parameters optimization algorithm
based on the ant colony algorithm. The algorithm first determines the parameter optimization design evaluation function, and then rapidly identifies several suboptimal paths by using particle swarm optimization and initializes the pheromones in the path. Ant colony algorithm finds the optimal solution according to the initialization pheromones and using the characteristics of rapid convergence.

The paper “Architecture Model to Improve the Development of Robotics Online Reconfiguration” made an innovative way to combine runtime software architecture and robotic development is proposed, and then uses model-driven techniques to establish a rigorous and useable abstract architecture meta-model and robotic system meta-model in order to improve the online reconfiguration. On the other hand, model difference and merge operations are constructed and proposed in order to improve the bidirectional transformation.

The paper “Neighbor Position Verification with Improved Quality of Service in Mobile Ad-hoc Networks” proposed a protocol called Neighbor position verification (NPV), in order to verify the position of its communication neighbors and detect the adversaries in the mobile ad hoc network; this protocol is used to exchanges the messages and verifies the position of communicating nodes in the network.

Paper “An AUV Integrated Navigation Method Based on Multi-sensor Data Fusion” presents the overall design of integrated navigation method based on GPS / INS / EC / DG that uses the Kalman filtering method to do error correction analysis. In the MATLAB environment, simulate realistic environmental parameters, simulation rationality navigation algorithm.

The paper “Development of a PoE Switch Based Remote Control System for Controlling Home and Office Appliances with Data Communication Facility” aims to design and construct a PoE switch based system: to control electric appliances such as light, fan, heater, washing machine, motor, TV, etc. and simultaneously data communication facility. Especially PoE switch can manage power and data separately by a splitter which motivated the need to research into it not only for industrial application but also for domestic use or home use. Power is use for controlling devices and data is for communication purpose. This system will play an important role for the elderly and physically disabled people to control their home appliances in intuitive and flexible way through Wi-Fi and internet.

Paper “A Multiscale Finite Element Model for Avascular Tumor Growth” proposed a multiscale finite element model that spans three distinct scales for the avascular tumor growth. At the extracellular microenvironment level, they proposed a new set of piecewise reaction diffusion equations to describe the extracellular microenvironment of the tumor growth. At the intracellular cycle level, it proposed a cell cycle control factor to model the key role that played by the G1-S phase transition. At the cellular level, it introduced the proposed cell cycle control factor to combine the extracellular microenvironment, the intracellular cycle and the cellular cycle into the total energy equations to form the finite element cellular model.

The paper “Effect of TCVR Controlled Voltage on Short-Circuit Calculations in Case of Ground Fault in the Algerian Network” studies the effect of voltages injected by TCVR, whether positive or negative, on short-circuit calculations. The type of fault considered is a ground fault that occurs at the end of a high voltage line compensated at its midpoint by TCVR while maintaining a fixed fault resistance.
In the paper “Study on Experiment of Acoustic Transmission in Pipe String”, a longitudinal wave transmission experiment is conducted for oil pipes with limited length, and experimental environment and equipment are prepared. The experimental objects include 10 oil pipes of three sizes, and each pipe is arranged with a set of velocity sensor.

The paper “Research on Innovative Design of Portable Quick-drying Machine” states that the invention of clothing quick-drying device has solved this problem and has brought great convenience to people living in wet areas. According to the need of the people at home or traveling, this paper brought a new design conception which makes innovative design and research from the function and structure, materials and technology and human relationships. To let people use it at the same time feel a happy convenience life.

In the paper “A Study on the Water Gate Operation in the Canal System by MIKE 3 FM”, MIKE3 FM was setup and used to investigate the circulation system with respect to the operation of the water gates will present at the ends of the canal system. The model was computed under various tidal conditions in Incheon coastal. The numerical modeling of the water flow helped to determine the gate operation that will play an important part in the water circulation in the canal. Water gate operation was possible to maintain the specific water level. Optimal water gate operation was decided for the Songdo waterfront canal system.

The paper “Landing Risk Assessment of Carrier-Based Aircraft Based on Fuzzy Multi-Attribute Group Decision Making”, extends the concept of decision-maker, and proposes a method of fuzzy multi-attribute decision making with normal fuzzy linguistic variables as decision-making information. Based on the establishment of carrier-based aircraft landing model, the expressions of risk evaluation indicators are ensured, and the relative attribute weight is calculated by the simulation of the safe flight area in landing process.

The paper “Characteristics of Exponential Distribution with Respect to Preventive Maintenance” primarily investigates characteristics of exponential distribution taking into account periodic preventive maintenance. As a secondary consideration, the paper also investigates characteristics of Weibull distribution to provide a platform for comparison.

Paper “A Study of Schoolroom Lighting Fuzzy Control System” proposes a lighting fuzzy control system based on CC2430. The deviation and transformation rate comparing ideal illumination and the practical one has inference by Fuzzy Model Reference adaptive system (FMRAS), and it can compensate natural light illumination stabilizing schoolroom lighting through PWM code. The system core hardware structure and adaptive fuzzy control algorithm have been expressed. Simulation results show that the control system accords with government standard, and achieves the desired effect.

In the paper “Study on Series Control Method for Dual Three-Phase PMSM based on Space Vector Pulse Width Modulation” a method which adopted a TBTSB-SVPWM strategy with two modulators, was proposed. It ensures the inverter output voltage only contains two kinds of fundamental components required by the two series-connected motors with a single VSI, making it possible to realize decoupling control of two-motor dual three-phase PMSM series-connected system.
Authors of the paper “Development of Real-Time Pipeline Management System for Prevention of Accidents” call pipelines as "LifeLine". These pipelines do not support their core roles to citizens and it can easily see that pipeline accidents have given inconvenient facts or serious man-made disasters to modern citizens as well. Nowadays, it lives in times using ICT - sensor technologies. So these environments have been advanced and are probably possible to resolve pipeline management problems using them beforehand in real time. Thus, ICT convergences will encourage us to make new technologies and paradigms on the field of pipeline management.

In the paper “Acoustic Emission Detection on a Background of Industrial Noise for the Rock Mass Monitoring Systems”, principles of modern algorithm construction of detection acoustic emission impulses and preliminary classification of there are sources danger degree is given. Given algorithm is worked out taking in to account modern digital systems of acoustic information processing. It is based on the adaptive changing principle of the discovering level of detection of the useful signal while performing non-standard parameters valuation of danger degree of acoustic emission impulse sources.

The paper “Adaptive Scheduling Model in Hybrid Flowshop Production Control using Petri Net” introduces a Petri net-based adaptive scheduling model for easing the qualitative analysis of the production system and reducing the complexity. Resource-oriented Petri Net (ROPN) is used to establish the relation in terms of logics and behaviors of various resources, converting the dynamics control of manufacturing system into resources aspects. After the model analysis and a real-life case illustration, this model can perform good interpretation of various objective functions and real case considerations. That could be used for guiding production schedules control and automation.

The paper “Development of an Effective Routing Protocol for Cluster Based Wireless Sensor Network for Soil Moisture Deficit Monitoring” focuses on special case of irrigated agriculture in gravity and pressurized irrigation. The authors have formulated a deployment strategy and developed an efficient routing protocol LATHAR (Location aware Threshold Based Hierarchical and Adaptive Routing) for transmitting the data packets from sensor node to the access point. The protocol has been tested on simulation model developed in ns2 simulator and it has been found to perform best in almost all the matrices used to evaluate the performance of WSN.

Based on the paper “Study on the Flow Characteristics and Erosion Phenomenon of Frac Sleeve by Using a CFD Approach”, motion characteristics of fracturing fluid and sand particles are obtained; the structure parameters can be optimized. The frac sleeve after structural optimization obtains better erosion resistance. This study shows that Computational Fluid Dynamics could be a useful tool to study the dynamics and internal flow of fracturing tool.

Paper “UAV Formation Occupying Technology Research Collaborative” aims at the unmanned aerial vehicles automatic attack process of single target, in accordance with the principle of maximum killing the enemy and establish the model of target threat based on the situation of two sides. According to the importance of the members, defense model, and the enemy motion trajectory with the threat model and the cooperative attack and defense model of pseudo tracking site, the cooperative tracking of pseudo trace point to obtain the best accounts for the site and to fight against the target.
The paper “An Efficient Power Management for Wireless Sensor Systems” describes the authors’ attempt to resolve problems with existing TPC algorithms, reduce the number of unnecessary changes in transmission power level (TPL) using the slope value of linear regressed equation, and present an algorithm for deriving TPL in a fast and appropriate manner.

The paper “The Research of RRT Route Planning Algorithm for UAV that Based on Kinematic Equation” provides an improvement algorithm which combined aircraft kinematics equation, and use this algorithm to the three dimensional(3D) path planning.

The paper “A 5GHzVCO with Series Varactor Bank to Compensate Large Kvco” presents the design of a voltage controlled oscillator (VCO) with small VCO gain (Kvco) variation. To compensate large Kvco variation, a series varactor bank has been added to the conventional LC-tank with parallel capacitor bank array. Implemented in a 0.13 m CMOS RF technology, the proposed VCO can be tuned from 4.6GHz to 5.5GHz with the Kvco variation of less than 9.6%. While consuming 3.1mA from a 1.2V supply, the VCO has -120dBc/Hz phase noise at 1MHz offset from the carrier.

Paper “Performance Assessment of Power Plant Main Steam Temperature Control System based on ADRC Control” makes an assessment of the typical main steam temperature system in thermal power plant. Due to main steam temperature system is a cascade control system. So, it should be assessed with the performance assessment method of cascade control systems. So firstly, this paper deduces the theoretical process of performance assessment of cascade control system based on minimum variance. Then with this method assesses the performance of four typical loads in thermal power plants when using active disturbance rejection-proportion (ADRC-P) cascade control and smith active disturbance rejection-proportion (SADRC-P) cascade control respectively. Finally, makes comparison of the results.

Authors of the paper “Design of an Aperture-Coupled Microstrip Array Antenna for Millimeter-wave Radar System” designed and interpreted the array antennas of the aperture-coupled microstrip operating in the millimeter-wave band for radar system. The microstrip array antenna can be designed with a transmission line circuit and a matching circuit in the same substrate. Therefore it is easy to combine with the active elements of the system. They add the slots to the patch to overcome it because general microstrip patch antennas have narrow band characteristics. It has designed the U-shaped slots in the patch. The substrate of patch for an aperture-coupled is used for general dielectric layer, and the substrate of transmission line for T-junction feeding is used FR4-epoxy. At this time, the analyzed center frequencies are 17 resonance mode from 24 GHz to 77 GHz at the 4☓4 array.

Paper “The Attitude Control Based on Active Disturbance Rejection Control for the Small-Scale Unmanned Helicopter” presents a design of three channel controller based on active disturbance rejection control which has a fast response, high control precision, good robustness, strongly adaptability. This design approach does not need accurate mathematics model of the small unmanned helicopter. Input-output feedback linearization is intended primarily for the system output and system control input to establish a direct relation. The final aim is to develop a robust tracking control scheme which ensures that the outputs of closed-loop system track the given expectations.
Paper “Multiple USB Webcam Link Control System for Reading QR Codes of Micro PCR Biochip Calibration Factor Values” established a system that automatically turns the USB cameras on and off by operating solid state relay modules and a micro controller unit used in micro PCSs.

In the paper “Application of GA-based NMPC for pH Value Control in Sewage Disposal”, the process of pH neutralization reaction in sewage disposal is characterized with highly nonlinearity and hysteretic nature. In the thesis, first of all, it is described for the process of neutralization reaction in sewage disposal as well as its mechanism model, analyzed them by putting forward a strategy of NMPC based on Method of Genetic Optimization. The resolution of uneasy nonlinear optimization is to be made by utilizing Genetic Algorithm for an overall optimization, simple controlled parameters and etc.

The paper “Low-Power CMOS Programmable Gain Amplifier with a DC-offset Cancellation for a Direct Conversion Receiver” presents low-power Programmable Gain Amplifier (PGA) with a DC-offset cancellation for a direct conversion receiver (DCR) to reduce chip area, cost and power. In the receiver stage, the direct conversion architecture has simplified scheme as compared to the conventional super-heterodyne architecture because IF stage could be omitted in the direct conversion architecture, and the system can be a single chip. The PGA controls 8-level gains from 4dB to 60dB using the CMOS switches and passive resistors in parallel, and DC-offset circuit is based on a Miller effect technique. It is fabricated using Magnachip/SK Hynix 0.18-μm CMOS 1poly-6metal process. The proposed system showed excellent gain error of less than 0.24dB, very small die area of 0.015mm2 and low power consumption of 1.137mW.

In the paper “Special Transmission Gear Invalidation Analysis Coupled with Finite Element Method Based on Meshless Local Petrov-Galerkin Method”, aiming at high nonlinear problem of special transmission gear invalidation analysis, provided a method which based on Meshless local Petrov-Galerkin method coupled with finite element method and method to solve fracture problem of special transmission gear. Simulation calculation has been done to non-involute beveloid gear developed by project team. Calculation result verified efficiency of the simulation method. The method has important meaning to novel gear development and research.

In the study “Simulation Study on Serpentine Locomotion of Underwater Snake-like Robot” a simulation model of underwater snake-like robot is established to investigate the relationship between the motion performance and the mechanical structure characteristics together with serpentine gait parameters. Based on the density ratio defined as the ratio of snake-like robot density to water density, the locomotion speed, output power and energy consumption of underwater snake-like robot is discussed.

The paper “Development of the Beam-forming Control Device for the Ultrasound Measurement” presented the proposed development of the Switching MUX with the array transducer by use of Delay-And-Sum Beam-forming technology for a more accurate measurement. Among the several measurement methods, it is studied two ways, i.e. Pulse-Echo method and the radiation conductance measurement. In this paper, it proposes to the multi-purpose Switching MUX all interfacing the two methods mentioned earlier. And it is verified that beam-forming control of the proposed equipment is smoothly implemented.
through simulation. And multi-purpose Switching MUX proposed in this thesis is modularized by 64 ports in order to reduce the hardware size.

The paper “The Design of a Low Power Consumption High-voltage Side for Current Transducer” states that traditional current transformer (CT) has more and more problems in the process of development, and a new hybrid current transformer (HOCT) obvious advantages, still need to focus on one of the core problems is the problem of high voltage side processing system power. The greater the power consumption of high end processing system, power link the more complex the cost is higher; Reduce the power consumption of the high pressure end processing system can well solve the problem. The low power design of high pressure end processing system are introduced, the main measures are given, and mainly introduces the program design.

Paper “Study on Simulation of Machining Deformation and Experiments for Thin-walled Parts of Titanium Alloy” focuses on the thin-walled parts of titanium alloy that is the difficult-to-machine material, based on the analysis of deformation characteristics and force, the milling force mathematical model of the ball-end milling cutter was established. On the basis of the 3D milling model of thin-walled parts of titanium alloy, the deformation regularity and cutting force variations were analyzed with the finite element simulation method. Through the experiments of machining thin-walled parts, the cutting force model was verified.

In the paper “Disturbance Attenuation for a Class of Exponentially Uncertain Switched Linear Systems with State Delay” address the disturbance attenuation problem for a class of state delay switched linear systems with exponential uncertainties via switched state feedback and switched dynamic output feedback, respectively. By using Taylor series approximation and convex polytope technique, exponentially uncertain switched linear systems with state delay is transformed into an equivalent switched polytopic model with additive norm bounded uncertainty.

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