## Advances in Mechatronics and Control Engineering III

Selected, peer reviewed papers from the 2014 3rd International Conference on Mechatronics and Control Engineering (ICMCE 2014), August 27-28, 2014, Zhuhai, China

von P. Yarlagadda

1. Auflage

Trans Tech Publications 2014

Verlag C.H. Beck im Internet: www.beck.de ISBN 978 3 03835 291 4

## **Table of Contents**

## **Preface and Conference Organization**

## **Chapter 1: Artificial Intelligence, Algorithms and Computation Methods**

A New Random Encryption Algorithm for Character Type Cipher Y. Chen	3
Exploiting Thread-Level Parallelism Based on Balancing Load for Speculative Multithreading Y.C. Li	8
FNMF-ITWC Algorithm Applied to the Cancer Gene Expression Data D. Wang	12
Fuzzy Set Based Clustering Algorithm of Web Text H.X. Wan and Y. Peng	19
MIMU Parameter Identification for Large Misalignment Angles Based on AFSA K.P. He, C.Y. Wang and Y. Li	23
Reduction of Risk Control Indicators of ERP System Based on Rough Set Z.H. Zhang and Y.J. Hua	28
<b>Research on Stereo Matching Algorithm in Intelligent Vehicle Application</b> P. He and F. Gao	35
Researching on the Single Lock Chamber Automatic Layout Algorithm X. Chen, J. Zhu and Z. Zhang	39
Rough and Fuzzy Set Based Classification Algorithm on Computer Practice Teaching Evaluation	42
H.X. Wan and Y. Peng Scheduling Based on an Ant Colony Algorithm with Crossover Operator Q. Li, W. Ba and J.L. Liu	43 47
Study of Parameters Configuration in Ant Colony Algorithm Y.R. Cui	51
Study on the Soft Time Windows Vehicle Synthesis Algorithm Based on Genetic J.M. Ai and P. Du	55
A New Forecasting Model of Fuzzy Time Series H.X. Wang, J.C. Guo, H. Feng and H.L. Jin	59
An Improved Forecasting Model of Fuzzy Time Series H.X. Wang, J.C. Guo, H. Feng and H.L. Jin	64
Key Technology in a Lightweight WPF-Based Electronic Map Engine L. Peng	70
Improved Ant Colony Algorithm on Scheduling Optimization of Cloud Computing Resources	7.5
X.X. Hu and X.W. Zhou	75
Chapter 2: Mathematical Methods and Data Mining, Information Technologies in Industry	
A Novel Four-Order Chaotic System with N-Attractor Multi-Direction Multi-Scroll Attractors W.S. Yin, D.J. Wei and S.Q. Chen	81
An Optimization and Planning Method Research to Determine Power Transmission Capacity of Clustering Wind Farms Accounting Risk B. Xiao, T.L. Cui, G. Mu, X.J. Dong and D.S. Dang	89
Association-Analysis-Based Research on Self-Healing of Information System and its Application	
L. Yan, L.Z. Zhu, L. Xie and Z.F. Wang	94

Discussion on a New Calculation Method for Missing True Formation Thickness - A Case Study from YM32 Area in Northern Tarim Basin	
X.Y. Luo, C.R. Dai and X.F. Yan	98
Equilibriums of an SIS Epidemic Model J.H. Wang	103
Necessity of Bioinformatics in the Setting of Pharmacy G.Y. Xu, L.P. An, X. Han, H.Q. Wang and P.G. Du	107
ρ-Mixing Random Sequences H.Y. Li and X.L. Tan	112
<b>Top-Down Saliency Detection via Hidden Semantic Information</b> L.F. Yuan, Y.L. Du and W.B. Wan	116
Using a Combined Method to Forecasting Electricity Demand X.Q. Gui, L. Li, P.S. Xie and J. Cao	120
Origin Fresh Beer Remote Delivery System Based on Cloud Computing Technology G. Ma and R.Y. Zhang	126
The Research of Technical Architecture of Semi-Structured XBRL Data Based on Hadoop Cluster and Structured Data Exchange System J.P. Zhu, P.P. Wang, D. Wang and Y. Wang	130
Chapter 3: Sound, Image, Signal and Video Processing and Technologies	
A New Adaptive Threshold Image-Denoising Method Based on Edge Detection Y. Jiao and B.W. Huang	137
An Edge Detection Algorithm for Image Corrupted by Impulse Noise D.H. Shen, X. E and L.C. Zhang	143
An Integrated Saliency Model with Guidance of Eye Movement in Natural Scene Classification Y.L. Du, L.F. Yuan and W.B. Wan	147
Application of Improved Sobel Algorithm in Medical Image Edge Detection D.H. Shen, X. E and L.C. Zhang	151
<b>Application of Infrared Binocular Vision for Monitoring Moving Target in Port</b> L. Liu, Y.J. Zhang, J. Liu and X.F. Yang	155
Color Images Illumination Compensation Method for Human Face Region Detection Y. Yu, X.B. Li and H.Y. Sun	162
<b>Detection of Unattended and Removed Objects in Public Areas</b> X. Huang, Y. Zhao, Z.X. Cheng, Y.L. Yuan and X.H. Liang	166
Fire Image Detection System Based on Cloud Workflow Z.B. Bi and H. Yang	174
Grayscale Image Acquisition for Raised Characters Based on Grating Image X.Y. Li, Y.D. Liu and G.L. Lu	180
Laser Scanner System Correction Research Based on Image Recognition H.F. Yan and J.M. Chen	185
<b>Pedestrian Detection Based on Bag-of-Visual-Words and SVM Method</b> J. Li, Y.J. Liao and H.M. Zhang	189
Study on Characteristic Extraction of Coal and Rock at Mechanized Top Coal Caving Face Based on Image Gray Scale	102
G.H. Xue, B.H. Hu, X.Y. Zhao, E.M. Liu and W.J. Ding  Efficient High-Precision Feature Extraction Method in Side Scan Sonar Image	193
Chapter 4: Sansors Testing Detection Instrumentation Massurement	197
Chapter 4: Sensors, Testing, Detection, Instrumentation, Measurement and Monitoring Technologies	

203

 $\begin{array}{c} \textbf{Correlation Analysis of Target Lane's Evaluation Data} \\ G.W.\ Zhang\ and\ X.T.\ Zhang \end{array}$ 

Design of a Dynamic Data Acquisition and Internet Network Based Transmission System for Reservoir Water Level	
D.B. Dai, Y.J. Wang, Y.P. Jiang and Z.G. Liu	207
Design of WSN Identifier Encoding Conformance Test System Based on Web Z.Y. Luo, T. Cai and W.S. Yang	212
Effect of Uniaxial Stress on Magnetic Permeability and Magnetic Loss of Low-Carbon Steel in Weak Alternating Magnetic Field X.Y. Li and Z.D. Han	220
Error Processing for Acquisition System of Heating Flux of Building Envelope G.H. Cheng, R.R. Sun and L.Y. Han	228
Inherent Time-Delay Determination for Acquisition Module of Electronic Transformer X.D. Hu, Q. Huang, J. Wu and J. Shi	233
Multi-Sensor Data Fusion Technology Based on BP Neural Network Application in the Coal Mine Equipment Fault Diagnosis X.Z. Meng, H.L. Liu and Z.S. Hou	238
Parameter Selection Based on Support Vector Machines for Tongue Spectral Identification Model	
W.J. Yan, G.Q. He, S.J. Huang and L. Qin	242
Primary Total Ionizing Dose Effect Studies on Xilinx SoC Irradiated with <sup>60</sup> Co γ Rays Y. Zhang, X. Du, X.C. Du, D.S. He, L.G. Zhang, C.H. He, Y.H. Li, H. Zang, S.H. Liu, X.Z. Liu, W. Chen, Y.Y. Fan, C. Xiong and D. Tang	252
Research on Application of Plan Surveying Technology in Shot-Put Sports J. Zhang and W.J. Song	260
Research on Optimization of Safety Parameters of the Ferromagnetic Pipeline Based on Magnetic Memory Testing Z.J. Liao, C.J. Yang and L.T. Zhao	264
Single Event Effects Testing of Xilinx Zynq-7010 SoC with <sup>239</sup> Pu Alpha Irradiation X.C. Du, S.H. Liu, C.H. He, X. Du, Y.H. Li, Y. Zhang, W. Chen, X.Z. Liu and D.S. He	268
Study of the Composite Oscillator of Particulate Monitoring Instrument Based on TEOM Y. Liang, Z.F. Zhang, W.L. Chen and K.X. Xu	274
The Design of Wearable Exercise Monitoring System K.J. Pei	281
The Influence of Bubbles on the Performance of Ultrasonic Flow Meter W. Wen, G.H. Zong, Y. Yu and L. Sun	285
Three-Dimensional Information Acquisition Based on Artificial Compound Eye Vision	
System A.H. Chen, B.W. He and C.H. Gao	290
Wireless Vehicle Detector Based on Magnetoresistive Sensors S.Y. Cheng, X.M. Zhou and Q. Jiang	295
Real-Time Monitoring and Automatic Control for Aerosol Cultivation of Lettuce B.G. Yao and Z.F. Zhang	299
The New Miracle of Software Manufacturing Instrument - "10^(-17)" H.Q. Ying, S. Shen and J.M. Liu	305
The Research of Armored Vehicles Weapon System Fault Diagnosis Method H.F. Xu	309
Diagnosis and Estimation of Sensor Bias in Dynamic Systems Using Adaptive Techniques R. Aarthi and R.A. Natarajan	313
<b>Moving Mode of Wireless Capsule Endoscopy Driven by External Magnetic Field</b> G.L. Shi and F.L. Ye	318
Chapter 5: Design Technologies in Mechatronics, Industrial Robots, Automation and Control Technologies	
An Optimization Design Method of Geometric Parameters of Skid Shoe Referring to Subject Weight of Marine Structures	
F.Y. Yang, X.Z. Yan, Z.R. Song, M.W. Yang, Z.K. Zhao and C. Lv	325

Control System Design on Rope Haulage Monorail Transport System Using Frequency	
Conversion N.B. Zhang, X. Pang and X.L. Zhou	333
Design and Experimental Research of Upper Gravity-Supporting Device on the Upper Limb Rehabilitation Robot Q.Z. Yang, J.P. Song, J.H. Zhao, Z.H. Wang and L.Q. Guo	338
Design and Implementation of Metering Abnormal and Online Diagnosis System of New	330
Generation Intelligent Substation L.J. Dong, X. Liu, Q. Zhang and B. Hu	343
<b>Design and Implementation of the Health Examination Robot Control System Architecture</b> D.H. Huang, H.J. Zhou and J. Cui	352
Design and Simulation of a Steering Engines' Stiffness Testing System L. Sun, G.H. Zong, W. Wang and W. Wen	360
<b>Design Method for the Automatic MPPT Wind Power Generator System</b> Y.R. Bai, B.Q. Kou and C.C. Chan	365
Designing of a Mobile Robot Using Photovoltaic Cells P.C. Patic, L. Pascale and M. Mâinea	373
Nonlinear Model Predictive Control for Automatic Train Operation with Actuator Saturation and Speed Limit	2==
L.S. Wang and H.Z. Xu  Research of Magnetic Field Navigation Intelligent Vehicle System Based on Difference	377
Algorithm W. Dong and H.X. Bie	382
Research on Intelligent Actuation Control Technology of High-Speed Solenoid Valve Y. Chang, G.Y. Ouyang and Z.M. Liu	388
Research on the Method of Variable-Frequency Hysteresis SVPWM Current Control for Three-Phase PWM Rectifier X. Chen and S.Q. Wei	392
Study on Sliding Mode Control in Bidirectional DC/DC Converter Based on State Space Averaging Method Y. Mei	399
The Design of Neuro-Fuzzy Control System Based on Data Fusion X.R. Fu	406
The Researches and Experiments of the Dynamic Operating Characteristic of Construction Machinery Gearbox	
J.Y. Tian, J. Xu, S.X. Lan and P. Zhou  Research of Brushless Doubly-Fed Generator for Grid-Connection and Power Control  Y. Liu, Z.C. Wei, X.M. Gao, X. Chen, X.F. Wang and Z.H. Zhang	410 417
Optimal Design of Energy-Saving Induction Cooker Power Controller Based on Fuzzy Technology	422
P.Q. Zheng and Q.S. Yu  A Method of Bionic Odor Source Spatial Positioning to Mobile Robot Based on Fuzzy Logic Algorithm	423
Z.Q. Zhao and J.D. Fang	429
<b>Design of a High-Speed Long-Stroke Heavy-Load Magnetically Suspended Door System</b> B.B. Huang, C. Zhang and Y.Y. Liao	436
Chapter 6: Computer Networks, Communications Technology and E-Applications	
<b>Design of Four-Arm Equiangular Spiral Antenna in Mine Communication</b> X.Y. Ran and Z. Yu	447
Study on the Emission Source of Laser Video Communication Z.C. Wu, Y.J. Gao, H.Y. Li, L. Zhao, L. Gong and F.Y. Liu	452
The Cell Search Procedure and PCI Planning in TD-LTE L. Zhou, L.L. Kang and S.K. Chi	456

The Research of Response Time and Scheduling Algorithm in the TTCAN Bus Control Networks	
L.M. Wang and X.L. Yan	461
<b>Vulnerability Model-Based Web Applications Security Testing Approach</b> C. He and Y.F. Liu	468
Barriers and Benefits in the Adoption of E-Government in China A. Abuduaini	473
Performance of HD Radio System J. Ren	477
The Improvement of LEACH Router Protocol Based on Geography and Energy Z.H. Yuan, B. Li, N. Wang and X.L. Zhang	482
An Intelligent Routing Algorithm in Wireless Sensor Networks Based on Reinforcement Learning	407
W.J. Guo, C.R. Yan, Y.L. Gan and T. Lu	487
Chapter 7: Modern Electronic, Power and Circuit Technologies, Electrical Systems	
A CMOS Input Buffer for High-Resolution A/D Converters with High Sampling Rates X.F. Huang, R.B. Hu and L. Li	497
A Novel Input Buffer Used for SHA-Less Pipeline ADC L. Li, X.F. Huang, M.Y. Xu, X.F. Shen and X. Chen	501
Current Test System Design Based on LabVIEW R. Li, J.S. Guan and Y.Q. Liu	505
<b>Design and Application of Motor Start Compensator</b> Y.J. He and M.Q. Wu	509
Optimization the Arrangement of Power Cable Lines in Tunnel G.H. He, Z.P. Zhang, M.S. Xie, Y.X. Wu, D.X. Yang, J. Xu and K. Xu	513
<b>Reason Analysis and Governance Advice for Low Voltage in Distribution Network</b> B.F. Qian, G.X. Lin, Y.K. Jiang and R.T. Wang	518
<b>Divergence Operator a Novel Power Conditioning System</b> B.F. Chen and D.Y. Du	524
Improved Virtual-Flux-Linkage Observation Method of PWM Rectifier W.S. Bu and L.L. Xu	528
Instance and Mechanism Analysis of Power Oscillation Caused by Valve Discharge Characteristics of Steam Turbine Y.H. Li, W.B. Chen, Z.Q. Liu, W. Yao and J.Y. Wen	533
Research on the Calculation of Auto Power Balance X.F. Wu, Q.Y. Zhu and G. Wang	537
Chapter 8: Materials and Manufacturing Processes, Applied Mechanics	
Einite Element Medal Analmin and the Daine And Hamin a CHarm Tomak	
Finite Element Modal Analysis on the Drive Axle Housing of Heavy Truck Q. Jia and L. Wang	547
Finite Element Simulation and Comparison of Hydraulic Splitting Fracturing Test of Concrete X.Z. Wang, H.F. Zou, S.W. Zheng, Y. Li and J.Y. Liu	551
Fluid-Structure Interaction Simulation of Wind Turbine	
D.L. Lin, Z. Pang, K.X. Zhang and S. You  Modal Analysis on a Runner Chamber for a Large Hydraulic Bulb Tubular Turbine  C.Z. Huang, L. Li, Z.C. Yang and Z.W. Yu	556
C.Z. Huang, J. Li, Z.C. Yang and Z.W. Xu  Optimization of Extraction of Tannins from Banana Peel Using Response Surface	561
Methodology T.R. Wu, H.L. Wang, S.W. Jiang, D.D. Liu and F. Wei	566
Strength Analysis of Bulk Cement Truck Body Based on NASTRAN O. Jia	572

The Numerical Simulation and Experimental Research of Combustor in Micro Thermophotovoltaic Systems C. Li, B. Xu, J. Wu, Y. Cheng and Z.H. Ma	576
The Numerical Simulation of Swirling Airflow Field for Different Swirling Airflow Head in	370
Swirling Airflow Finishing J. Zeng, Z.Y. Hou and H.Z. Jiang	582
Wind-Induced Responses of a Transmission Angle Tower in Coastal Areas Y.J. Wu, B. Chen, G.J. Wang and Q.J. Chen	587
The Optimization on Tread Profile Based on Wheel-Rail Match H. Xie	591
Effect of Ultrasound Power on Ni-Nd <sub>2</sub> O <sub>3</sub> Nanocomposite Coatings Prepared by Electrodeposition in Combination Ultrasonic Field Z.H. Ao, Y.J. Xue, X.H. Li and D.Y. Zhang	597
Research of Layered Machining Experiment by Micro-EDM J.K. Xu, L.S. Zhang and F. Huang	601
Electroforming Technology of Ni-CeO <sub>2</sub> Nanocomposites Using Rotating Cylindrical Cathode in Ultrasonic Field	
D.Y. Zhang, Y.J. Xue, X.H. Li and Z.H. Ao	606
Comparison of COREX and COSRI Process Technology Development X.L. Zhou, Z. Shi, G.F. Zhang and Z.N. Du	612
Research Status of Physical Simulation on LF Furnace Refining Ladle X.L. Zhou, Z. Shi, G.F. Zhang and Z.N. Du	616
Research Status of Numerical Simulation on LF Furnace Refining Ladle X.L. Zhou, Z. Shi, G.F. Zhang and Z.N. Du	620
Chapter 9: Engineering Education, Engineering Management and Industrial Engineering  "Theory of Machines and Mechanism" Teaching Reform to Inspire Mechanical Design	
Thinking Y.F. Wu	627
Analysis on Individual Strategy Behavior Based on Differentiating Spatial Cognition in Special Event Z.H. Li, Z.Z. Yuan and L. Zhao	632
Research and Implementation of Intelligent Question Answering System in MOOC W.J. Dong and G.H. Geng	639
Modern Business Strategy Customer Relationship Management in the Area of Civil Engineering	
M. Jocovic, B. Melovic, N. Vatin and V. Murgul  Personal on Evaluation System for Comprehensive Quality of College and University	644
Research on Evaluation System for Comprehensive Quality of College and University Students Based on Analytic Hierarchy Process Model L.Y. Wang	648
Research on Mobile Learning Based on a Feedback Model B. Dong	653
Revenue Sharing Contract Model Based on CVaR Rules: Research on Contract Phone Card G. Sun and L. Hong	657
Study on the Construction of Teaching Resources Platform Based on Cloud Space B.W. Huang and Y. Jiao	663
The Research of Applied Analysis Method on Shaped Charge Detonation Parameters B. Chen, G. Yu, X.G. Zhou, Y.H. Dou, Z.R. Qu and M.F. Li	
	666
Reflection on Intelligent Monitoring Caused by Significant Production Accidents J. Zhang and J.D. Shi	666 672

The Engineering Drawing Network Potting Management System Based on Intelligent Print Queue Management	
T. Li	689
Design of Network Seal Usage Examination and Approval Process Based on CRP Digital Campus Information Management Platform	<b></b>
B.W. Huang and Y. Jiao	693
Evolutionary Game Research on the Core Business and Consumer Behavior in Green Supply Chain under IOT Environment	
K. Qi and M.L. Bi	697
Research on the Improvement of General Assemble Line Bottleneck for the Car J.H. Gong, Q.Y. Zhu and L.J. Zhang	705
The Application of Quality Control Chart Based on Minitab in the Processing of Camshafts S.W. Liu, Y.K. Wang and H.B. Xin	712
Field Investigation and Assessment on Base Conditions of a Transmission Tower in Coastal Mound Areas	
G.J. Wang, B. Chen, Y.J. Wu and Z.P. Peng	716
Characteristics of K Nutrient Input/Output and its Balance for Wheat Season in China L.M. Chuan, H.G. Zheng, C.P. Tan, S.F. Sun and J.F. Zhang	720