Dehuai Yang (Ed.)

Informatics in Control, Automation and Robotics

Volume 2
Foreword

2011 3rd International Asia Conference on Informatics in Control, Automation and Robotics (CAR 2011) is held on December 24–25, 2011, Shenzhen, China.

The purpose of the 2011 3rd International Asia Conference on Informatics in Control, Automation and Robotics (CAR 2011) is to bring together researchers, engineers and practitioners interested in the application of informatics to Control, Automation and Robotics.

The conference is organized in three simultaneous tracks: “Intelligent Control Systems and Optimization”, “Robotics and Automation” and “Systems Modeling, Signal Processing and Control”. We welcome papers from all these areas.


Although CAR 2011 receives 850 paper submissions, only 219 were accepted as regular papers, based on the classifications provided by the Conference Committee and the reviewers. The selected papers also reflect the interdisciplinary nature of the conference. The diversity of topics is an important feature of this conference, enabling an overall perception of several important scientific and technological trends. These high quality standards will be maintained and reinforced at CAR 2011, and in future editions of this conference.

Furthermore, CAR 2011 includes 2 plenary keynote lectures given by internationally recognized researchers. They are Prof. Patrick S.P. Wang, Ph.D., Fellow, IAPR, ISIBM and WASE Northeastern University Boston, and Prof. Jun Wang, Department of Mechanical & Automation Engineering, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong. Their presentations presented an important contribution to increasing the overall quality of the conference, and are partially included in the first section of the book. We would like to express our appreciation to all the invited keynote speakers who took the time to contribute with a paper to this book.

On behalf of the conference organizing committee, we would like to thank all participants. First of all to the authors, whose quality work is the essence of the conference and to the members of the program committee, who help us with their expertise and time.

As we all know, producing a conference requires the effort of many individuals. We wish to thank all the people from IERI, whose work and commitment are invaluable.
Committee

Honorary Chair

ChinChen Chang National Chung Hsing University, Taiwan
Patrick S.P. Wang Fellow, IAPR, ISIBM and WASE Northeastern University Boston, USA

Program Co-chairs

Yuntao Wu Wuhan University of Technology, China
Weitao Zheng Wuhan University of Technology, China

Publication Co-chairs

Honghua Tan Wuhan Insitute of Technology, China
Dehuai Yang Huazhong Normal Universiy, China

International Committee

Wei Li Asia Pacific Human-Computer Interaction Research Center, Hong Kong
Xiaoming Liu Nankai University, China
Xiaoxiao Yu Wuhan University, China
Chi Zhang Nanchang University, China
Bo Zhang Beijing University, China
Lei Zhang Tianjin Institute of Urban Construction, China
Ping He Liaoning Police Academy, China
Alireza Yazdizadeh International Science and Engineering Center, Hong Kong
Wenjin Hu Jiangxi Computer Study Institute, China
Qun Zeng Nanchang University, China
# Contents

## Robotics and Automation

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Simulation of Smog Diffusing Based on Particle Swarm Optimization</td>
<td>1</td>
</tr>
<tr>
<td>Jianfeng Xu, Lan Liu, Qun Liu</td>
<td></td>
</tr>
<tr>
<td>Self-compensating Technology for Disturbing Torque of Space Swing</td>
<td>9</td>
</tr>
<tr>
<td>Camera</td>
<td></td>
</tr>
<tr>
<td>Wang Xiaoyong</td>
<td></td>
</tr>
<tr>
<td>Matrix Multiplication Parallelization on a Many-Core Platform</td>
<td>19</td>
</tr>
<tr>
<td>Pollawat Thanarungroj, Chen Liu</td>
<td></td>
</tr>
<tr>
<td>Solar Power Station Monitoring System with Five Remote Functions and</td>
<td>27</td>
</tr>
<tr>
<td>Double Intelligent Control Loop</td>
<td></td>
</tr>
<tr>
<td>Dingjin Huang, Yunqiang Zheng, Hadi Malek</td>
<td></td>
</tr>
<tr>
<td>Design of Portable Solar Energy System with Fast-Stationed Feature</td>
<td>35</td>
</tr>
<tr>
<td>Dingjin Huang, Yanwu Ma</td>
<td></td>
</tr>
<tr>
<td>The Fuzzy Binary Relations on ( n )-Frustum Pyramid Fuzzy Number</td>
<td>41</td>
</tr>
<tr>
<td>Space and Its Application</td>
<td></td>
</tr>
<tr>
<td>Jiaxi Zhang, Guixiang Wang, Jie Du</td>
<td></td>
</tr>
<tr>
<td>Similarity Relation of Two-Dimensional Frustum Pyramid Fuzzy Numbers</td>
<td>49</td>
</tr>
<tr>
<td>Based on the Geometry and Its Application</td>
<td></td>
</tr>
<tr>
<td>Jie Du, Guixiang Wang, Jiaxi Zhang</td>
<td></td>
</tr>
<tr>
<td>Robust Controller Design for One Arm Space Manipulator with</td>
<td>59</td>
</tr>
<tr>
<td>Uncertainties Compensated</td>
<td></td>
</tr>
<tr>
<td>Guangyan Xu, Meng Zhang, Huanqiang Wang</td>
<td></td>
</tr>
<tr>
<td>Design of Quasi-periodic Satellite Formation at Critical Inclination</td>
<td>67</td>
</tr>
<tr>
<td>Guangyan Xu, Huanqiang Wang, Meng Zhang</td>
<td></td>
</tr>
</tbody>
</table>
Deadbeat Control Technique Applied to Active Power Filter .......... 75
Lan Li, Hai Chen, Xiaoxia Cao

The Development of Spectral Responsivity Testing System .......... 85
Jin Ren-cheng, Dong Huan-huan, He Cheng-qun, Chu Jin-kui

A Robust and Fast Eyelash Detection Basted on Expectation
Maximization and Gaussian Mixture Model ......................... 93
Ting Wang, Min Han, Honglin Wan, Yong Yin

Application Study on Internet of Things in Environment Protection
Field ............................................................ 99
Shixing Li, Hong Wang, Tao Xu, Guiping Zhou

Multiresolution Based Segmentation for Nonideal Iris with Nonlinear
Diffusion .......................................................... 107
Honglin Wan, Min Han, Ting Wang

Gait Programming and Data Acquisition User Interfaces, for Modular
Snake Robots ....................................................... 113
Kamilo Melo, Laura Paez, Andrea Polo, Carlos Parra

Design of a Mobile Robotic Arm for People with Severe Disabilities ...... 119
Hiroki Higa, Hideyuki Uehara, Takashi Soken

An Emergency Call Device for Wheelchair Users with Severe Disabilities ... 123
Bintao Wang, Hiroki Higa, Hideyuki Uehara, Takashi Soken

Toward Human-Robot Interaction Design through Human-Human
Interaction Experiment ............................................ 127
Yutaka Hiroi, Akinori Ito

Research Survey of Technique about Wire-Driven Parallel Suspension
Systems Used in Forced Oscillation Experiments in Low-Speed Wind
Tunnels for Obtaining Dynamic Derivatives ......................... 131
Yaqing Zheng, Shuaihe Zhao

A Novel Miniature Microstrip Antenna for GPS Applications .......... 139
Hong-Gang Hao, Hua-Xiao Lu, Wei Chen, Chao An

Camera Response Function Estimation and Application with a Single
Image ................................................................. 149
Li Fu, Yue Qi

Automatic Extraction and Verification of State-Models for Web
Applications ....................................................... 157
Andrey Zakonov, Anatoly Shalyto
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recommender System to Analyse Students’ Learning Productivity</td>
<td>161</td>
</tr>
<tr>
<td>Arturas Kaklauskas, Mark Seniut, Edmundas Kazimieras Zavadskas,</td>
<td></td>
</tr>
<tr>
<td>Gintautas Dzemyda, Voitech Stankevic, Ceslovas Simkevicius,</td>
<td></td>
</tr>
<tr>
<td>Sergejus Ivanikovas, Tomas Stankevic, Agne Matuliauskaite,</td>
<td></td>
</tr>
<tr>
<td>Lina Zemeckyte</td>
<td></td>
</tr>
<tr>
<td>Intelligent Pupil Analysis of Student Progress System</td>
<td>165</td>
</tr>
<tr>
<td>Arturas Kaklauskas, Andrej Vlasenko, Vidas Raudonis, Edmundas Kazimieras Zavadskas</td>
<td></td>
</tr>
<tr>
<td>Research on “Multi-screen in One” Technology of Education Video</td>
<td>169</td>
</tr>
<tr>
<td>Oriented U-learning</td>
<td></td>
</tr>
<tr>
<td>Jun Xiao, Lamei Wang, Xiaoxiao Zhu</td>
<td></td>
</tr>
<tr>
<td>An Advanced Subspace Projection Method for the Weak Signal DOA</td>
<td>177</td>
</tr>
<tr>
<td>Estimation in Presence of Coherent Strong Signals</td>
<td></td>
</tr>
<tr>
<td>Hou Shuai, Yang Jingshu, Chen Gong</td>
<td></td>
</tr>
<tr>
<td>Study of Node Localization Algorithm Based on Improved Particle</td>
<td>185</td>
</tr>
<tr>
<td>Swarm Optimization and RSSI for WSNs</td>
<td></td>
</tr>
<tr>
<td>Shen Ming-yu, Lu Ya-jing, Zhao Ming-shun</td>
<td></td>
</tr>
<tr>
<td>Research on a Memory-Weighted Learning Model for Fictitious Play</td>
<td>195</td>
</tr>
<tr>
<td>Chun-yan Yu, Xiao-sheng He, Yu-qi Lin, Feng-qin Chen</td>
<td></td>
</tr>
<tr>
<td>Improved S Surface Controller and Semi-physical Simulation for AUV</td>
<td>203</td>
</tr>
<tr>
<td>Chong Lv, Xinhua Zhang</td>
<td></td>
</tr>
<tr>
<td>Optimal Battery Energy Storage System Charge Scheduling for Peak</td>
<td>211</td>
</tr>
<tr>
<td>Shaving Application Considering Battery Lifetime</td>
<td></td>
</tr>
<tr>
<td>Xuzhu Dong, Guannan Bao, Zhigang Lu, Zhichang Yuan, Chao Lu</td>
<td></td>
</tr>
<tr>
<td>Applications of Data Sharing Approaches in P2P Environments</td>
<td>219</td>
</tr>
<tr>
<td>Mutaz Beraka, Sofien Gannouni, Hassan Mathkour</td>
<td></td>
</tr>
<tr>
<td>Rolling Process Automation for Instant Ramen Noodles</td>
<td>225</td>
</tr>
<tr>
<td>Byung Kook Yoo, Dong Sang Yoo</td>
<td></td>
</tr>
<tr>
<td>The Pressure Detection and Control for Gas Tightness Test of Metal</td>
<td>231</td>
</tr>
<tr>
<td>Capillary Tube</td>
<td></td>
</tr>
<tr>
<td>Yang Yu, Min Zhao, Yongheng Yang</td>
<td></td>
</tr>
<tr>
<td>Combined Vision and Frontier-Based Exploration Strategies for</td>
<td>237</td>
</tr>
<tr>
<td>Semantic Mapping</td>
<td></td>
</tr>
<tr>
<td>Islam Jebari, Stéphane Bazeille, David Filliat</td>
<td></td>
</tr>
<tr>
<td>Research and Application of Optimization Extreme of Nonlinear</td>
<td>245</td>
</tr>
<tr>
<td>Function Based on Particle Swarm Optimization Algorithm</td>
<td></td>
</tr>
<tr>
<td>Qi Han, Li Zhang</td>
<td></td>
</tr>
</tbody>
</table>
Design of Temperature Measuring and Controlling System Based on STM32 .......................................................... 253
Xiangtong Kong, Chunping Wang, Shuying Sun

Expert-System-Based Design of Large Networks of Deployable Mechanisms ...................................................... 259
Bingyin Ma, Zongquan Deng, Hailin Huang, Bing Li, Rongqiang Liu

A Heuristic Algorithm for the Initial Codebook Design in Vector Quantization .................................................... 263
Xu Yatao, Lin Changqing, Yuan Qin, Zheng Deshun

Efficient SAT-Based Verification of Asynchronous System .................. 273
Xu Yatao, Lin Changqing, Yuan Qin, Zhou Conghua

Three Dimensional Optimal Guidance Law for Micro Missiles to Attack Maneuvering Targets .............................................. 283
Zhigang Wang, Wei Li

Optimal Maneuver Technology for Satellite Formation Flying ............... 287
Zhigang Wang, Xiang Chen

Comparisons between Two Kinds of Star Sensor Measurement Models by Attitude Estimation Accuracy ............................................ 291
Zhigang Wang, Yifan Deng

Hypersonic Vehicle Attitude Single-Channel Controller Design Based on Spatially Optimal Rotation Vector ................................... 295
Zhigang Wang, Yu Ning

Shield Attitude Rectification Decision Function Based on Support Vector Data Description .................................................. 299
Guo Zheng-gang, Wang Feng-tao, Sun Wei

Embedded Microscope Vision Based Mechanical Platform for LED Wafer Automatic Inspection .............................................. 309
Xinyan Gao, Ning Zhou, Dakui Li, Yuan Yue

A Selective Encryption Scheme for H.264/AVC Video Coding .................. 317
Wei Huang, Wenqing Fan, Tingting Zhang

Independent Component Analysis Based on Smooth Discrete Wavelet Coefficients .......................................................... 325
JingHui Wang, YuanChao Zhao

Nonlinear Control Design of a Hypersonic Aircraft Using Sum-of-Squares Method .................................................. 333
Zhiling Yang, Hongfei Sun
3D Flight Simulation Based on Virtools
Ying Xiao, Wei Mei, Xiaowei Zhang

343

Design of Large-Scale PV Power Station Supervisory Control and Data
Acquisition System Based on Fieldbus and Industrial Ethernet
Yao Hongchun, Xu Ming

351

Design and Implementation of a SOLR Plug-in for Chinese-English
Cross-Language Query Expansion Based on SKOS Thesauri
Wei Sun, Fabrizio Celli, Ahsan Morshed, Yves Jaques, Johannes Keizer

359

A Study on the Implementation of Data Storage and Data Curve in
Monitoring and Control System Software
Weiqiang Zhao, Yongxian Liu, Mowu Lu, Qingjun Guo

369

Vibration Analysis of a Certain Type of Aero-engine Turbine Blade Based
on UG
Weiqiang Zhao, Yongxian Liu, Mowu Lu, Qingjun Guo

377

Research and Implement of Distributed Network Motion Control
System
ChongQuan Zhong, HaiBo Jin, YeChen Han, ZhanMeng Wang

383

On the Optimization of Dijkstra’s Algorithm
Seifedine Kadry, Ayman Abdallah, Chibli Joumaa

393

Design and Performance Study of Smart Antenna Systems for WIMAX
Applications
Ayman Abdallah, Seifedine Kadry, Chibli Joumaa

399

Research on the Evaluation of Feature Selection Based on SVM
Yongjun Ma, Linqiang Zhan

407

A Study on the Impact of Photovoltaic Power Network-Connected on
Voltage and Power Loss of Distribution Network
Yi Zhao, Li Liu, Gang Wang

415

Research of Double-Bar Parallel COSA Finger for Humanoid Robot
Hands
Han Liu, Wenzeng Zhang

423

Research of Passive Grasp Multi-fingered Robot Hand
Jiangxia Shi, Wenzeng Zhang

431

Analysis of Coupled-Active Fingers with Gear Mechanism
Mengyang Liang, Wenzeng Zhang

439

Hybrid Under-Actuated Robotic Finger with Triple Pulley-Belt
Mechanism
Yifan Liu, Wenzeng Zhang

447
Robot Remote Control Using Bluetooth and a Smartphone Augmented System .......................................................... 453
Gaowei Chen, Scott A. King, Michael Scherger

The Proportion Integral Control of Torque with AC Servo System .............. 461
Xiaoyuan Wang, Pingxin Wang, Peng Gao, Zhe Yang

Design and Development of Intelligent Meter Reading System Based on M-Bus ........................................................... 469
Xiao-yuan Wang, Peng Gao, Zhe Yang

Fuzzy Path Planning of Two-Wheeled Robot Optimized by Gold Mean ......... 477
Peng Shu-hua, Hao Cui, Li Deng-hua

Research on HVDC Model in Transient Voltage Stability Analysis of AC/DC Transmission Systems ........................................... 485
Zhichang Yuan, Licheng Li, Yongjun Liu, Shukai Xu

A Low-Complexity Tag Number Estimate in EFSA Protocol for RFID Tag Anti-collision .......................................................... 495
Zeng Yu, Wu Haifeng, Tan Yuan, Liu Jing

Collaboration and Collision Functions for Plan-Based and Event-Driven Mission Control ......................................................... 503
Wolfgang Meyer, Arne von Drathen

Quality-First Pattern-Based Clustering Approach with Fuzzed Thresholds ........................................................................ 511
Qian Ma, Jingfeng Guo

Decoupling Algorithm Design of Flight Control System for Attack UAV .... 521
Xue-ping Zhu, Jun Yang, Tao Xu

Linear Precoder for MIMO Wireless Channels Based on SVD ................. 529
Shan Zhao, Naiqian Zhang, Biaoli Jin, Dong Li

6-Axis Robot Design and Simulation Based on SimulationX .................... 537
Luyan Bi, Lisheng Liu

Rov Magnetized Magnetic Field Measurement and Magnetic Dipole Model ........................................................................ 545
Weiming Cheng, Chong Kang, Hui Li, Jinku Lv

Adaptive Modulation and Coding in Cognitive Radio Networks ............... 553
Yuling Zhang

Design of a FPGA-Based Multiple Motors Control System ..................... 557
Yue Ma, Rong Xiong, Fan Zhang
Research for All-Around Battlefield Situation Assessment .......... 569
    Jing-Xue Liu, Yun-Yao Yi

Efficient Spatial Decision-Making for Maritime Search and Rescue Using
3D GIS .......................................................... 577
    Qinghua Qiao, Tong Zhang, Ming Yang

Development and Application of the Neuro-stimulation Device .... 583
    Ruituo Huai, Junqing Yang, Hui Wang

Hierarchy Modeling and Co-simulation of a Dynamically Coarse-Grained
Reconfigurable Architecture ........................................ 589
    Ren Chen, Lu Ma, Du Yue, Wen Wen, Zhi Qi

Battery Energy Storage System Based Power Quality Management of
Distribution Network .............................................. 599
    Zhigang Lu, Guannan Bao, Hanchen Xu, Xuzhu Dong, Zhichang Yuan,
    Chao Lu

Efficient Support Vector Regression with Weighted Constraints .... 607
    Ling Wang, Dong Mei Fu

Torque Analysis of Spherical Permanent Magnetic Motor with Magnetic
Equivalent Circuit and Maxwell Stress Tensor .......................... 617
    Bin Li, Chao Liu, Hongfeng Li, Guidan Li

Levitation Force Analysis for Spherical Permanent Magnet Bearingless
Motor .............................................................. 629
    Bin Li, Junjie Shi, Guidan Li, Hongfeng Li

The Study of a Sound Category Neural Model on Perceptual Magnet
Effect ............................................................... 639
    Shaobai Zhang, Lili Wang

Research on Speaking Rate Effects to the Production of Speech Sounds .... 647
    Shaobai Zhang, Yanyan Liu

Multi-pass Dispatching Algorithm Based on Data Mining .......... 653
    Sun Zijin, Li Li

General TSA Protocol for Coping with the Capture Effect in RFID
Systems ............................................................ 661
    Yuan Tan, Haifeng Wu, Jihua Feng, Jing Liu, Zhongting Deng

A Graph-Based Spatial Mapping Algorithm for a Coarse Grained
Reconfigurable Architecture Template ................................ 669
    Lu Ma, Wei Ge, Zhi Qi
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Oxide Fuel Cell Performance with Developed FeCr Alloy Interconnect</td>
<td>679</td>
</tr>
<tr>
<td>Deni S. Khaerudini, Mohd Asharaf Othman, Shahrudlin Mahzan, Daniela Fredrick, Tjipto Sujitno, Puji Untoro, Darwin Sebayang</td>
<td></td>
</tr>
<tr>
<td>Morphological Edge Detection Method of Multi-structure and Multi-scale Based on Image Fusion in Wavelet Domain</td>
<td>685</td>
</tr>
<tr>
<td>Jing Liu, Xinze Luan, Xiaolin Tian, Yankui Sun</td>
<td></td>
</tr>
<tr>
<td>Large Time Behavior of Solutions to a Problem for Conservation Law</td>
<td>693</td>
</tr>
<tr>
<td>Huiping Cui</td>
<td></td>
</tr>
<tr>
<td>The Analytical Algorithm of Program Quaternion in the Arbitrary Spacecraft Attitude-Adjusting Control</td>
<td>697</td>
</tr>
<tr>
<td>Shaobo Ni, Jianwu Wu, Jiayuan Shan, Lei Liu, Mao Su</td>
<td></td>
</tr>
<tr>
<td>A Self-adaptive Fault Monitoring Method Based on EMD</td>
<td>705</td>
</tr>
<tr>
<td>Zhao Zhenhao, Sun Yongjin</td>
<td></td>
</tr>
<tr>
<td>NEAT versus PSO for Evolving Autonomous Multi-agents Coordination on Pursuit-Evasion Problem</td>
<td>711</td>
</tr>
<tr>
<td>Jin Zhao, Gang Peng</td>
<td></td>
</tr>
<tr>
<td>Visual Sensing Method Based on Texture Analysis for Automatic Seam Tracking Systems</td>
<td>719</td>
</tr>
<tr>
<td>Zou Yirong, Du Dong, Wang Li</td>
<td></td>
</tr>
<tr>
<td>Evaluation on the Categorical DBMS for the Manufacturing Intelligent System</td>
<td>725</td>
</tr>
<tr>
<td>Yuanping Xu, Hongping Shu, Jun Lu</td>
<td></td>
</tr>
<tr>
<td>Research of Buoy with Floating Movement</td>
<td>733</td>
</tr>
<tr>
<td>Shiming Wang, Linlin Jiang, Jing He, Xianzhu Ai, Xin Tang</td>
<td></td>
</tr>
<tr>
<td>A Image Retrieval Method Based on Color Histogram</td>
<td>741</td>
</tr>
<tr>
<td>Wu Junyun</td>
<td></td>
</tr>
<tr>
<td>The THP Three-Dimensional Model of Modern Enterprise Operation</td>
<td>747</td>
</tr>
<tr>
<td>Lili Zhang, Jianhua Ren</td>
<td></td>
</tr>
<tr>
<td>Drowsiness Detection from EEG Spectrum Analysis</td>
<td>753</td>
</tr>
<tr>
<td>Yabo Yin, Yunkai Zhu, Shi Xiong, Jiacai Zhang</td>
<td></td>
</tr>
<tr>
<td>High Precision BLDCM Servo Control with Nonlinear Identification</td>
<td>761</td>
</tr>
<tr>
<td>Di Bao, Wei Huo</td>
<td></td>
</tr>
<tr>
<td>The Traveling Salesman Problem Base on Triple-Stranded DNA Structure Model</td>
<td>769</td>
</tr>
<tr>
<td>Jing Yang, Zhi-xiang Yin, Kai-feng Huang</td>
<td></td>
</tr>
</tbody>
</table>
Robust Control of Strip Thickness for Cold Rolling Mill .......................... 777
Zhang Xiaofeng, Zhang Qingdong

A Digital Entertainment System Based on Augmented Reality ............... 787
Mandun Zhang, Lei Wu, Lu Yang, Yangsheng Wang

The Fluid-Solid Interaction Analysis of WDPSS-8 Based on ANSYS ........ 795
Shaoni Jiao, Yaqing Zheng, Gui Lin

Comprehensive Evaluation on the Urban-Rural Integration Process within Harbin Metropolitan Area Based on the Grey Multi-level Evaluation Model .......................................................... 803
Lihong Han, Guangji Tong, Lei Shi

Recognition of Combined Arm Motions Using Support Vector Machine .... 807
Yanjuan Geng, Dandan Tao, Liang Chen, Guanglin Li

Optimization and Verification for a Robot Control System Based on Learning Petri Net Model ................................................................. 815
Liangbing Feng, Masanao Obayashi, Takashi Kuremoto, Kunikazu Kobayashi

Reviews on the Cognitive Radio Platform Facing the IOT .................... 825
Yajuan Tang, Qing Li

Author Index .......................................................... 835