

# **2006 IEEE International Conference on Automation Science and Engineering**

**Shanghai, China  
8-10 October 2006**

**Volume 1 of 2**



**IEEE Catalog Number: 06EX1348  
ISBN: 1-4244-0310-3**

**Copyright © 2006 by The Institute of Electrical and Electronics Engineers, Inc.  
All Rights Reserved**

*Copyright and Reprint Permissions:* Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republications permission, write to IEEE Copyrights Manager, IEEE Operations Center, 445 Hoes Lane, Piscataway, New Jersey USA 08854. All rights reserved.

IEEE Catalog Number: 06EX1348

ISBN: 1-4244-0310-3

LOC: 2006922285

**Additional Copies of This Publication Are Available from:**

IEEE Service Center

445 Hoes Lane

Piscataway, NJ 08854

IEEE Service Center

445 Hoes Lane

Piscataway, NJ 08854

Phone: (800) 678-IEEE

(732) 981-1393

Fax: (732) 981-9667

E-mail: customer-service@ieee.org

# Table of Contents

## Plenary Talk

A Model for Industry-University Collaborative Research: Transforming Specific Problem Solutions into Broad Design Methodologies.....	1
--	---

*John T. Wen*

Automatic Interpretation of Human and Vehicle Motion for Enhanced Security.....	2
---	---

*Tieniu Tan*

## Keynote Papers

Multi-Period Production Capacity Planning for Integrated Product and Production System Design.....	3
--	---

*Emre Kazancioglu, Kazuhiro Saitou*

Improving Analysis & Simulation of Continuous Petri Nets.....	9
---	---

*L.. Recalde, C. Mahulea, M. Silva*

Distribution Network Design with Random Demand and Unreliable Suppliers.....	15
--	----

*Guy A. Tanonkou, Lyès Benyoucef, Xiaolan Xie*

Intensity Preserving Contrast Enhancement for Gray-Level Images Using Multi-Objective Particle Swarm Optimization.....	21
--	----

*N. M. Kwok, Q. P. Ha, D. K. Liu, G.. Fang*

## Session SP1-1: Automation in Life Sciences 1

A Simulation Framework for Cell Manipulation.....	27
---	----

*L. Zhang, J. Cecil*

Single-Cell Information Extraction and Viability Analysis Using Automated Microscopy ...	33
--	----

<b>Automation of Challenging Spatial-Temporal Biomedical Observations with the Adaptive Scanning Optical Microscope (ASOM) .....</b>	<b>39</b>
<i>B. Potsaid, J. T. Wen, F. P. Finger</i>	
<b>Design and Simulation of a Piezoelectrically Actuated Micropump for the Drug Delivery System .....</b>	<b>45</b>
<i>Q.-F. Cui, C.-L. Liu, X. F. Zha</i>	
<b>A Multilevel Automation Concept for the Target-Based Production of Radioisotopes for Cancer Treatment.....</b>	<b>51</b>
<i>A. Eursch, M. Harfensteller, M. Schilp, M.F. Zaeh, J. Moreno, E. Kabai, E. Huenges, M. Mentler</i>	
<b>A Smart Environment for Biometric Capture .....</b>	<b>57</b>
<i>L. Middleton, D.K. Wang, A.I. Bazin, J.N. Carter, M.S. Nixon</i>	

## **Session SP1-2: Robotics 1**

<b>Accuracy-Based Architecture Optimization of a 3-DOF Parallel Kinematic Machine .....</b>	<b>63</b>
<i>Q.-S. Xu, Y.-M. Li</i>	
<b>Optimization of the Workspace of PKM with 2 DOF .....</b>	<b>69</b>
<i>S. Stan, R.. Bălan, V.. Mătiegă</i>	
<b>A Large Displacement and Decoupled XYZ Flexure Parallel Mechanism for Micromanipulation .....</b>	<b>75</b>
<i>X.-Y. Teng, I.-M. Chen</i>	
<b>Velocity Analysis of Omnidirectional Mobile Robot and System Implementation .....</b>	<b>81</b>
<i>C.-T. Leng, Q.-X. Cao</i>	

## **Session SP1-3: Semiconductors 1**

Schedulability and Scheduling of Dual-Arm Cluster Tools with Residency Time Constraints Based on Petri Net .....	87
<i>N.-Q. Wu, M.-C. Zhou</i>	
Token Delays and Generalized Workload Balancing for Timed Event Graphs with Application to Cluster Tool Operation .....	93
<i>T.-E. Lee, H.-Y. Lee, R. S. Sreenivas</i>	
A Fast Rescheduling Method in Semiconductor Manufacturing Allowing for Tardiness and Scheduling Stability .....	100
<i>M. Cheng, M. Sugi, J. Ota, M. Yamamoto, H. Ito, K. Inoue</i>	
On-Line Rescheduling for Semiconductor Manufacturing .....	106
<i>H.-P. Huang, T.-Y. Chen</i>	
Performance Evaluation and Schedule Optimization of Multi-Cluster Tools with Process Times Uncertainty.....	112
<i>S.-W. Ding, J.-G. Yi, M. T. Zhang, R. Akhavan-Tabatabaei</i>	

## Session SP1-4: System Modeling and Simulation 1

Automatic Generation of Component-Level Dynamic Equations Using Extensible Element Linear Graph Method.....	118
<i>Y.-Z. Li, Z.-Q. Lin, H. Wang, Y. Chen</i>	
Design of Dynamic Systems Based on Dynamic Fault Trees and Neural Networks .....	124
<i>Z.-B. Zhou, Z.-Q. Yan, J.-L. Zhou, G. Jin, D.-D. Dong, Z.-Q. Pan</i>	
Convergence of Parallel Dynamic Iteration Methods for Nonlinear DAEs of Index-2.....	129
<i>W. Sun, J.-H. Zou, W. Sun, X.-G. Fan</i>	
Backward-Traversing Waveform Relaxation Algorithm for Circuit Simulation and Simulation on Demand .....	134
<i>C.-J. Chen, J.-L. Yu, T.-N. Yang</i>	
Monitoring of batch processes with non-linear modeling methods .....	140

**A Methodology to Model Human and Organisational Errors on Offshore Risk Analysis .144**  
*J. Ren, J. Wang, I. Jenkinson, D.-L. Xu, J.-B. Y*

## **Session SP1-5: Instrumentation & Measurement**

<b>Characteristics of Induced Potential of Electromagnetic Flow Meter .....</b>	<b>150</b>
<i>J.-Z. Wang, C.-L. Gong, Y.-Q. Liu</i>	
<b>The Design of Field Information Detection System Based on Microcomputer .....</b>	<b>156</b>
<i>Z.-J. Qiu, J.-Y. Mao, Y. He</i>	
<b>Quantitative Analysis Using NIR by Building Principal Component-Multiple Linear Regression-BP Algorithm .....</b>	<b>161</b>
<i>Y.-N. Shao, Y. He, J.-Y. Mao</i>	
<b>Detecting Small Target of Ship at Sea by Infrared Image.....</b>	<b>165</b>
<i>J.-W. Lu, Y.-J. He, H.-Y. Li, F.-L. Lu</i>	

## **Session SP2-1: Automation in Life Sciences 2**

<b>An Automatic EEG Spike Detection Algorithm Using Morphological Filter.....</b>	<b>170</b>
<i>G.-H. Xu, J. Wang, Q. Zhang, J.-M. Zhu</i>	
<b>Operating Rooms Planning Using Lagrangian Relaxation Technique .....</b>	<b>176</b>
<i>M. Lamiri, X.-L. Xie</i>	
<b>Tremor Suppression of Elbow Joint via Functional Electrical Stimulation: A Simulation Study.....</b>	<b>182</b>
<i>D.-G. Zhang, W.T. Ang</i>	
<b>Providing Assistance to Knee in the Design of a Portable Active Orthotic Device .....</b>	<b>188</b>
<i>K. H. Low, Y.-H. Yin</i>	
<b>Instrumented Orthopaedics Analysis System.....</b>	<b>194</b>

## **Session SP2-2: Robotics 2**

<b>Stable Motion Planning for Dynamic Nonholonomic Mobile Robots .....</b>	<b>200</b>
<i>J. Ren, H.-J. Zhang, K.A. McIsaac, R.V. Patel</i>	
<b>Using the Forward Search and the Polynomial Approximation Algorithms in the Exact Algorithm for Manipulator's Control in an Unknown Environment .....</b>	<b>206</b>
<i>P. K. Lopatin, A.S. Yegorov</i>	
<b>Redundant Manipulator Control with Constraints for Subgoals .....</b>	<b>212</b>
<i>C.-W. Qiu, Q.-X. Cao, Y.-J. Sun</i>	
<b>Algorithm of Two-Step Eye-Hand Calibration by Resolving Linear Equations .....</b>	<b>218</b>
<i>Y. Shang, Q.-F. Yu, Z.-Q. Qiu</i>	

## **Session SP2-3: Semiconductors 2**

<b>Introduction to Automated Material Handling Systems in LCD Panel Production Lines ..</b>	<b>223</b>
<i>Y. J. Jang, G.-H. Choi</i>	
<b>Manufacturability of Multivariate Applications in the Semiconductor Industry .....</b>	<b>230</b>
<i>Y.-C. Chang, F.-T. Cheng</i>	
<b>Decomposition of Petri Nets for Optimization of Routing Problem for AGVs in Semiconductor Fabrication Bays .....</b>	<b>236</b>
<i>T. Nishi, R. Maeno</i>	
<b>A Novel Protective Cover in Assembling of Micro Components in a SEM Chamber.....</b>	<b>242</b>
<i>Al. Cvetanovic, An. Cvetanovic, D. Andrijasevic, I. Giouroudi, and W. Brenner</i>	
<b>Multi-Factory Capacity Planning in Semiconductor Assembly and Test Manufacturing with Multiple-Chip Products.....</b>	<b>247</b>
<i>S. Sweat, S. Niu, M.T. Zhang, Z.-C. Zhang, L. Zheng</i>	

Scheduling Semiconductor Wafer Fabrication with Optimization of Multiple Objectives	253
.....	.....
<i>Z.-T. Wang, F. Qiao, Q.-D. Wu</i>	

## Session SP2-4: System Modeling and Simulation 2

Evaluation of the Reliability of Emergency Networks Under Time Constraints .....	259
<i>W.-W. Wu, X.-X. Ning</i>	
Reliability Evaluation of Standby Safety Systems Due to Independent and Common Cause Failures .....	264
<i>L.-X. Lu, G. Lewis</i>	
Signal Detecting Based on Instantaneous Virtual Power.....	270
<i>W.W. Shi, J. Li</i>	
A Robust Statistical-Based Speaker's Location Detection Algorithm in a Vehicular Environment .....	274
<i>J.-S. Hu, C.-C. Cheng, W.-H. Liu, C.-H. Yang</i>	
Black-Box Modeling of a Two-Stroke Racing Motorcycle Engine for Virtual Prototyping Applications .....	280
<i>A. Beghi, M. Liberati, S. Peron, D. Sette</i>	

## Session MA1-1: Robotics 3

Evaluation of Dimensional Analysis in Robotics.....	286
<i>G. M. Biggs, B. A. MacDonald</i>	
Dynamic Reconfiguration for Robot Software .....	292
<i>Z. Yu, I. Warren, B. MacDonald</i>	
Implementing Bubblegrams: The Use of Haar-Like Features for Human-Robot Interaction .....	298
<i>J.E. Young, E. Sharlin, J.E. Boyd</i>	

Haptic Simulation of Multibody Contact Dynamics for Fixture Loading Planning .....	304
<i>T. Liu, M. Y. Wang</i>	
A Model for Virtual Emotional Human System .....	310
<i>L. Peng, W. Li, X.-J. Gu</i>	

## Session MA1-2: Manufacturing 1

Internet-Based Platform for an Integrated Design of Product and Manufacturing Process for SMEs .....	314
<i>L. Y. Xu, A. P. Li, B. Favre-Bulle</i>	
Research on Computational Method of Fault Probability for New Product Development Based on Intelligence and Integration.....	319
<i>F. Li, L.P. Zhao, Y.Y. Yao</i>	
Synthesis of Hierarchical and Distributed Control Functions for Multi-Product Manufacturing Cells.....	325
<i>K. Andersson, J. Richardsson, B. Lennartson, M. Fabian</i>	
Analysis of Capacity Overflow for Manufacturing Systems.....	331
<i>K.S. Cheung, K.O. Chow</i>	

## Session MA1-3: Inventory / RFID

Computerized Repairable Inventory Management with Reliability Growth and System Installations Increase.....	336
<i>T.-D. Jin, H.-T. Liao, Z.-H. Xiong, C.-H. Sung</i>	
Two-Instant Reallocation in Two-Echelon Spare Parts Inventory Systems.....	342
<i>H.-W. Song, H. C. Lau</i>	
Highly Reliable and Accurate Level Radar for Automated Legal Custody Transfer and Inventory Management .....	346
<i>B. Sai, B. Kastelein</i>	

Decision Support System for Exception Management in RFID Enabled Airline Baggage Handling Process .....	351
<i>N. Viswanadham, A. Prakasam, R. Gaonkar</i>	
Mobile Diagnosis Based on RFID for Food Safety .....	357
<i>H.-P. Huang, C.-S. Chen, T.-Y. Chen</i>	

## Session MA1-4: Planning & Scheduling 1

Transportation and HVAC Systems for Building Emergency Evacuation.....	363
<i>A. See, L. Michel, B. Xiong, P.B. Luh, S.C. Chang</i>	
A Class of Optimal Operation Planning for Kanban Managed Multi-Stage Production System .....	369
<i>Y.-M. Fang, Y.-J. Lin</i>	
Nested Partitions Method for the Local Pickup and Delivery Problem .....	375
<i>L. Pi, Y.-P. Pan, L.-Y. Shi</i>	
Scheduling Algorithms for Optimal Robot Cell Coordination – a Comparison .....	381
<i>A. Kobetski, D. Spensieri, M. Fabian</i>	
Autonomous Distributed Scheduling Adjustment Function with Interchanging Operations .....	387
<i>S.-C. Cho, K.-Y. Woo, K. Takamasu, S. Fujimura</i>	

## Session MA1-5: Petri Nets & Discrete Event Systems

Modeling and Analysis of Enterprise Processes .....	393
<i>L. Zhang</i>	
A Fast Algorithm to Find a Set of Elementary Siphons for a Class of Petri Nets.....	399
<i>X.-L. Liu, A.-R. Wang, Z.-W. Li</i>	
On-Line Identification of Discrete Event Systems: A Case Study .....	405
<i>M. Dotoli, M. P. Fanti, A. M. Mangini</i>	

<b>Efficient Learning Algorithms for Episodic Tasks with Acyclic State Spaces .....</b>	<b>411</b>
<i>S. Reveliotis, T. Bountourelis</i>	
<b>Semantics of Sensor Activation Graphs.....</b>	<b>419</b>
<i>T. Alenljung, B. Lennartson</i>	

## Session MP1-1: Manufacturing 2

<b>Service-Oriented Software Architecture for Flexible Manufacturing Control System.....</b>	<b>425</b>
<i>B. Wu, L.-F. Xi, B.-H. Zhou</i>	
<b>Study on Active Process Control of Burr Formation in Al-Alloy Milling Process .....</b>	<b>431</b>
<i>M. Chen, G. Liu, Z. Shen</i>	
<b>Research of Multi-Operation Quality Control Based on Minimum Quality Loss .....</b>	<b>437</b>
<i>C. Chen, L.-P. Zhao, Y.Y Yao</i>	
<b>An Object-Oriented Approach to Manufacturing Systems Modeling .....</b>	<b>442</b>
<i>L. Bassi, C. Secchi, C. Fantuzzi, M. Bonfe</i>	
<b>Optimal Polynomial Complexity Deadlock Avoidance Policies for Manufacturing Systems with Flexible Routings.....</b>	<b>448</b>
<i>K.-Y. Xing, F. Tian, H.-B. Xu, B.-S. Hu</i>	

## Session MP1-2: Robotics 4

<b>Design and Analysis of a Welding Robot .....</b>	<b>454</b>
<i>M. Bahrami-Samani, M. Agahi, S.A.A. Moosavian</i>	
<b>On Modeling a Soccer Robot System Using Petri Nets.....</b>	<b>460</b>
<i>B.-W. Guo, Z.-W. Li, S.-W. Xu</i>	
<b>Evolutionary Replication of Calligraphic Characters by a Robot Drawing Platform Using Experimentally Acquired Brush Footprint.....</b>	<b>466</b>
<i>K. W. Kwok, K. W. Lo, S. M. Wong, Y. Yam</i>	

Initial Prototype Design and Investigation of an Undulating Body by SMA .....	472
<i>K. H. Low, J. Yang, A. P. Pattathil, Y.-H. Zhang</i>	

## Session MP1-3: Microsystems

Development of a Micro Manufacturing System and its Efficiency Evaluation Method ...	478
<i>N. Mishima</i>	

Modeling of van der Waals Forces During the Assembly of Micro Devices .....	484
<i>L. Zhang, J. Cecil, D. Vasquez, J. Jones, B. Garner</i>	

The Creation of an Information Based Manufacturing Framework for Micro Devices Assembly: A Discussion of the Path Planning and Virtual Assembly Modules.....	490
<i>N. Gobinath, J. Cecil, A. Trivedi</i>	

## Session MP1-4: Planning & Scheduling 2

Parallel Populations Genetic Algorithm for Minimizing Assembly Variation in Selective Assembly.....	496
<i>S.G. Ponnambalam, S. S. Sankar, S. Sriram, M. Gurumariamuthu</i>	

Heuristic Methods to Solve the Alternative Subgraphs Assembly Line Balancing Problem .....	501
<i>L. Capacho, R. Pastor, O. Guschinskaya, A. Dolgui</i>	

Scheduling Parallel Batch Processors with Incompatible Job Families Using Ant Colony Optimization .....	507
<i>N. R. S. Raghavan, M. Venkataramana</i>	

An Application of Particle Swarm Optimization Algorithm to Permutation Flowshop Scheduling Problems to Minimize Makespan, Mean Flowtime and Completion Time Variance .....	513
<i>S. Chandrasekaran, S. G. Ponnambalam, R. K. Suresh, N. Vijayakumar</i>	

Self-Construction Production Scheduling System .....	519
--	-----

## **Session MP1-5: Controls 1**

<b>Adaptive Fuzzy Controller for Hybrid Traction Control System Based on Automatic Road Identification .....</b>	<b>524</b>
<i>J.-L. Zhang, D.-L. Chen, C.-L. Yin</i>	
<b>Fuzzy Model Predictive Control for a Comfort Air-Conditioning System .....</b>	<b>530</b>
<i>Y.-H. Huang, N.-P. Li, Y.-X. Yi, J.-L. Zhan</i>	
<b>A New Automatic Cooking Machine for Chinese Dishes .....</b>	<b>534</b>
<i>W.X. Yan, Z. Fu, Y.H. Liu, R.Q. Liu, Y.Z. Zhao, X.Y. Zhou, J.H. Tang, P. Yan</i>	
<b>Design of Bio-Fermentation Control System Based on the Embedded Microprocessor .....</b>	<b>540</b>
<i>X.-F. Lu, Y.-Q. Luo, H.-L. Yang, W. Wang</i>	
<b>An Internet-Based Control Engineering Laboratory for Undergraduate and Graduate Education .....</b>	<b>546</b>
<i>H.L. Wu, Y.R. Yang, Q.Q. Wang, S.N. Zhu</i>	

## **Session MP2-1: Manufacturing 3**

<b>Challenges for Handling Flexibility in the Change Management Process of Manufacturing Systems .....</b>	<b>551</b>
<i>H. Krappe, S. Rogalski, M. Sander</i>	
<b>A Middleware for Open CNC Architecture.....</b>	<b>558</b>
<i>Q.-P. Tang, Y. Wu, G.-R. Qin</i>	
<b>Optimal Advertisement-Innovation Mix for Maximizing the Discounted Flow of Profit.....</b>	<b>562</b>
<i>V. Prasanna Srinivas, N.R. Srinivasa Raghavan</i>	

## **Session MP2-2: Sensors**

<b>Sliding Mode Control with Sensor Fault Tolerant for Electronic Throttle .....</b>	<b>568</b>
<i>P.-Z. Zhang, C.-L. Yin, J.-W. Zhang</i>	
<b>A Novel Algorithm for Node Localization and Motion Analysis in Wireless Sensor Networks .....</b>	<b>574</b>
<i>S.-C. Li, D.-Y. Zhang, Z.-Y. Yang, N.-N. Chang</i>	
<b>Automated Intruder Tracking Using Particle Filtering and a Network of Binary Motion Sensors .....</b>	<b>580</b>
<i>J. Schiff, K. Goldberg</i>	
<b>An Alternative Approach in Sensing Simultaneous 3-DOF Motions.....</b>	<b>588</b>
<i>C. K. Lim, C. Y. Ang, I.-M. Chen, G.-L. Yang, W. Lin</i>	
<b>A New Data Association Algorithm for Multiple Passive Sensors .....</b>	<b>594</b>
<i>C. Li, C.-Z. Han, H.-Y. Zhu</i>	

## **Session MP2-3: Vision / Imaging**

<b>Visual Positioning Using Four-Point Planar Patterns.....</b>	<b>600</b>
<i>D. Xu, Y.-F. Li, M. Tan</i>	
<b>Research on Imaging Model of a Mechanism's Aiming Control Based on Visual Measurement .....</b>	<b>606</b>
<i>X.-Y. Wang, J.-F. Wang, Z.-H. Jia</i>	
<b>The Hybrid Calibration of Linear Structured Light System.....</b>	<b>611</b>
<i>K. Xie, W. Y. Liu, Z.-B. Pu</i>	
<b>An Algorithm for Locating Sky-Sea Line.....</b>	<b>615</b>
<i>J.-W. Lu, Y.-Z. Dong, X.-H. Yuan, F.-L. Lu</i>	
<b>Vision-Based Indoor Scene Cognition Using a Spatial Probabilistic Modeling Method ...</b>	<b>620</b>
<i>J.-S. Hu, T.-M. Su, H.-C. Huang, P.-C. Lin</i>	

<b>A Strategy Improving Registration Accuracy Progressively for INSAR Complex Image</b>	.....626
<i>S.-R. Peng, Y.-N. Wang, G.-C. Liu, W.-Z. Yang</i>	

## Session MP2-4: Supply Chains

<b>Performance Analysis of Complex Supply Chain Networks with Multi-Product.....</b>	<b>630</b>
<i>Y.-F. Wu, M. Dong</i>	
<b>A Resource Planning Model for Professional Services Organizations.....</b>	<b>636</b>
<i>M. Goh, K. Balaji, R. DeSouza, B. T. Eck, J.-Y. Hu, B. Ray</i>	
<b>The Research on Grid E-Business Technical System Based on a Trusted Third Part....</b>	<b>640</b>
<i>Y.-M. Dong, D.-X. Shuai</i>	
<b>An Evolutionary Game Model on Supply Chains Learning Through Imitation.....</b>	<b>645</b>
<i>M. Zhou, F.-Q. Deng</i>	
<b>An Adaptive Distributed Simulation Framework for a Server Fulfillment Supply Chain ...</b>	<b>649</b>
<i>Y. Chen, J. Fowler, T. Wu, T. Callarman, E. Ambrose, V. Hargaden</i>	

## Session MP2-5: Controls 2

<b>Optimal Control for Networked Control System via <math>\delta</math>-Operator Formulation.....</b>	<b>656</b>
<i>L.-B. Xie, W.-Y. Zhao, Z.-C. Ji</i>	
<b>Self-Adaptive Surge Adjustment Based on Fast Correlation Integral Method in Centrifugal Compressors .....</b>	<b>661</b>
<i>T. Sun, G.-H. Xu, C.-M. Zhang</i>	
<b>An Improved Algorithm for Coordination Control of Multi-Agent System Based on r-Limited Voronoi Partitions .....</b>	<b>667</b>
<i>Q. Jiang</i>	
<b>Sliding Mode-PID Controller for Robust Low-Level Control of a UGV .....</b>	<b>672</b>
<i>T.H. Tran, N.M. Kwok, M.T. Nguyen, Q.P. Ha, G. Fang</i>	

**Applying the Linear Matrix Inequality for Hybrid Fuzzy/H-infinity Control of Active Structural Damping.....678**

*C.-W. Chen, K. Yeh, C.-H. Tsai, C.-Y. Chen, D.-J. Wu*