PROCEEDINGS OF THE

IECON'93

International Conference on Industrial Electronics, Control and Instrumentation

Volume 3
Robotics, Vision and Sensors; and Signal Processing and Control
A Study on Full-Bridge Zero-Voltage-Switched PWM Converter Design and Experimentation
G. C. Hsieh, J. C. Li, M. H. Liaw, J. P. Wang, T. F. Hung, National Taiwan Institute of Technology, CHINA

New Quasi-Resonant PWM Inverter Using Two Internal Voltage Points of DC Source
A. Toba, G. Kimura, M. Shioya, Tokyo Metropolitan University, JAPAN

A Method for Improving Output Current of Series-Resonant AC Link Cycloconverter
H. Hayasaka, K. Matsuse, Meiji University, JAPAN

Fast Compensation by a Pulsed Resonant Current Source Active Power Filter
K. Hoffman, Queensland University of Technology, G. Ledwich, University of Queensland, AUSTRALIA

On the Design of High Frequency Series Resonant Converters for Induction Heating Applications

A New Induction Heating Circuit with Clamped Capacitor Voltage and Constant Output Current Suitable for Mass Production Applications
H. W. E. Koertzen, P. C. Theron, J. A. Ferreira, J.D. van Wyk, Rand Afrikaans University, SOUTH AFRICA

SESSION PE-13 Switching Mode Power Supplies
A Triple Output Capacitive Idling Cuk Converter with a Novel Control Scheme
S. Cuk, California Institute of Technology, Z. Zhang, TESLAco, USA

Quasi-State Variable Method for Precise Modeling of DC-DC Converter Circuits
M. Nakano, Y. Iijima, T. H. Chin, Sophia University, JAPAN

RCD Clamp PWM Forward Converter with Self Driven Synchronous Rectification
J. A. Cobos, O. Gracia, J. Sebastian, J. Uceda, University Politech de Madrid, SPAIN

SESSION RV-01 Computer Vision I: Low Level Vision
Invariant Line Segmentation for Object Recognition
W. C. So, C. K. Lee, Hong Kong Polytechnic, HONG KONG

Natural Images Segmentation for Patterns Recognition Using Edges Pyramids and its Application to the Leather’s Defects
A. F. Limas-Serafim, Institute Nacional de Eng. e Technology Ind., PORTUGAL

LINE Segment Patterns Hough Transform for Circles Detection Using a 2-Dimensional Array
R. K. K. Yip, Hong Kong Polytechnic, D. N. K. Leung, S. O. Harrold, City Polytechnic of Hong Kong, HONG KONG

An Automatic Rotation Invariant Technique for Color Objects and Patterns
D. P. Mital, G. W. Leng, Nanyang Technology University, SINGAPORE

VOLUME III
<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>R. C. Luo, P. Harsh, North Carolina State University, Hislop David W., US Army Res. Office, USA</td>
<td>Pattern Association from Noisy Images by The Network Constraint Analysis</td>
<td>1382</td>
</tr>
<tr>
<td>S. Ishikawa, Y. Ogami, K. Kato, Kyushu Institute of Technology, JAPAN</td>
<td>Calibration of Manipulator Using Vision Sensor on Hand Unit</td>
<td>1386</td>
</tr>
<tr>
<td>K. Nakazawa, Keio University, JAPAN</td>
<td>Tactile Pattern Recognition Using Neural Networks</td>
<td>1391</td>
</tr>
<tr>
<td>P. Emil M., University of Ottawa, CANADA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R. V. 02 Control of Robot Manipulator I</td>
<td></td>
<td></td>
</tr>
<tr>
<td>S. P. Chan, C. Y. Lee, D. P. Mital, Nanyang Technology University, SINGAPORE</td>
<td>A Disturbance Observer for Robotic Assembly of Odd Form Electronic Components</td>
<td>1395</td>
</tr>
<tr>
<td>S. Komada, Y. Ohkouchi, M. Ishida, T. Hori, Mie University, JAPAN</td>
<td>Robust Control of Robot Manipulators Based on Disturbance Observer in Task Space</td>
<td>1401</td>
</tr>
<tr>
<td>D. P. Stoten, E. J. Neighbour, Bristol University, UNITED KINGDOM</td>
<td>Adaptive Control of Robotic Manipulators with Minimization of Workpiece Deformation</td>
<td>1407</td>
</tr>
<tr>
<td>D. J. Pack, M. Meng, A. C. Kak, Purdue University, USA</td>
<td>Comparative Study of Motion Control Methods for a Nonlinear System</td>
<td>1413</td>
</tr>
<tr>
<td>P. Chan, C. Y. Lee, D. P. Mital, Nanyang Technology University, SINGAPORE</td>
<td>Robust Quasi-Linearized Motion Control of Rigid Robot</td>
<td>*</td>
</tr>
<tr>
<td>K. Tagawa, Y. Kanki, Y. Ohta, H. Haneda, Kobe University, JAPAN</td>
<td>A Parallel Processing Scheme for Dynamic Control of Robotic Manipulators</td>
<td>1419</td>
</tr>
<tr>
<td>Y. Shoji, M. Inaba, Toyo Eng. Corp., T. Fukuda, Nagoya University, JAPAN</td>
<td>Stable Control of 1 Degree-of-Freedom Linear Manipulator Based on Force Sensor Feedback in Contact Tasks</td>
<td>1425</td>
</tr>
<tr>
<td>S. Reis Cunha, A. Castilho Coimbra, F. M. Ferreira Lobo, Porto University, PORTUGAL</td>
<td>A Robot Motion Correction Scheme for a Vibrating Object Using the Kalman Filter</td>
<td>*</td>
</tr>
<tr>
<td>A. Castilho Coimbra, S. Reis Cunha, F. M. Ferreira Lobo, Porto University, PORTUGAL</td>
<td>Range Information Extraction Using U_BAT: An Ultrasonic Based Aerial Telemeter</td>
<td>1460</td>
</tr>
<tr>
<td>O. Patrouix, B. Jouvencel, University de Montpellier II, FRANCE</td>
<td>Navigation System Based on Ceiling Landmark Recognition for Autonomous Mobile Robot</td>
<td>1466</td>
</tr>
<tr>
<td>T. Fukuda, S. Ito, F. Arai, Nagoya University, Y. Abe, K. Tanaka, Y. Tanaka, Shinryo Corp., JAPAN</td>
<td>Control of Mobile Robots for the Push-a-Box Operation</td>
<td>1472</td>
</tr>
<tr>
<td>Y. Okawa, Osaka University, K. Yokoyama, Fujitsu Lab., K. Taguchi, Sanyo Electric Co. JAPAN</td>
<td>On Cooperative Conveyance by Two Mobile Robots</td>
<td>1478</td>
</tr>
</tbody>
</table>
SESSION RV-04  Path Planning of Robot Manipulator

Robot Path Planning in a Cluttered Workplace.................................................................................1482
A. Denker, Bogazici University, O. Kaynak, Tubitak Marmara Res. C., TURKEY

An Approach to Collision Avoidance Issues for Redundant Manipulator........................................1488
M. Shibata, K. Ohnishi, Keio University, JAPAN

Path Constrained Time-optimal Motion of a Cooperative Two Robot System .................................1494
H. K. Cho, B. H. Lee, Seoul National University, KOREA

An Optimal Manipulator Trajectory Calculation Algorithm with Synthetic Riccati Transformation ..............................1500
D. Cai, H. Yamaura, Y. Shidama, Shinshu University, JAPAN

An Experimental Study on Improvement of Weaving Trajectories of Welding Robots by a Learning Scheme ..................1506
S. Tadokoro, N. Kobayashi, N. Kawasaki, Kobe University, N. Miyazaki, Shin Maywa Ind., T. Takamori, Kobe University, JAPAN

Planning Link-Interference-Free Trajectories for a Parallel Link Manipulator ......................................1512

SESSION RV-05  Intelligent Sensors and Actuators I

Intelligent Sensors for Force and Weight Measurement Using Mechatronic Technology .................1522
M. Rouff, S. Konieczka, Ecole Superieure d'Electricite, FRANCE

A Laser Two Focus Velocimeter with High Spatial Resolution Using Confocal Optical System ........1527
Y. Minagawa, E. Okada, Keio University, JAPAN

A New Method of Computing the Coil Impedance of an Eddy Current Sensor ..................................1531
X. Qi-Hua, Z. Yong, Q. Yuan-Ning, Northwestern Polytech University L. Mei-Yun, X. Lu-Hua, Hebei Machine-electrical Collage, CHINA

High Frequency Oscillation Parametric Current Sensor with Feedback Loop .....................................1534
H. Kutsukake, Y. Tanno, Shinshu University, JAPAN

A High-Resolution Interpolator for Incremental Encoders by Two-Phase Type PLL Method .................1540
T. Emura, L. Wang, A. Arakawa, Tohoku University, JAPAN

Measurement of Oxygen Saturation in Microvessels Utilizing Spectrophotometric Determination ........1546
E. Okada, Y. Shinozaki, H. Minamitani, Keio University, JAPAN

Analog Processing Electronics in Intelligent Sensors for Advanced Robotics ......................................1551
A. Gandelli, R. Ottoboni, Politecnico di Milano, ITALY

A Study of Parametric Magnetic Sensor ...............................................................................................1556
K. Ono, Y. Tanno, Shinshu University, JAPAN

An Iterative Learning Approach to Error Compensation of Position Sensors for Servo Motors ..........1561
S. H. Han, I. J. Ha, T. K. Ha, H. Huh, Seoul National University, KOREA

Modeling a Linear and Limited Travel Solenoid ...................................................................................1567
N. C. Cheung, K. W. Lim, M. F. Rahman, University of New South Wales, AUSTRALIA

Characteristics Analysis of Multi-Layer Piezo-Ceramic Actuator (Part II) and its Application ...............1573
C. Kasuga, Shibaura Institute of Technology, F. Harashima, University of Tokyo T. Nishimura, Isuzu Adv. Eng. C., Ltd., M. Bann, Nissin Flour Milling Co., Ltd., Y. Nakagawa, Shibaura Institute of Technology, JAPAN
SESSION RV-06.1 Mobile Robot

Coordinative Object-Transportation by Multiple Industrial Mobile Robots Using Coupler with Elastic Mechanism
M. Hashimoto, F. Oba, S. Zenitani, Hiroshima University, JAPAN

Sensor-Based Control of the Reactive Behaviors of Walking Machines
P. Lepinay, R. Zapata, University de Montpellier II, FRANCE

D. Monieiro, B. Jouvencel, University de Montpellier II, FRANCE

A Scanning Laser Radar System for Obstacle Avoidance in Automotive Field
A. Najmi, A. Mahrane, G. Vialaret, D. Esteve, C.N.R.S, FRANCE

SESSION RV-06.2 Control of Flexible Manipulators

Optimal Handling Strategies of Flexible Beams by Using a Two Link Manipulator
F. Matsuno, N. Sakabe, M. Ikeda, Kobe University, JAPAN

Exact Observer for Flexible Joint Robots
A. Benallegue, A. Bennani-Hassan, Lab. de Robotique de Paris, FRANCE

An Optimal Solution for the Obstacle Avoidance Control of Variable Geometry Tentacle
G. Ciobanu, N. Bizdoaca, University of Craiova, ROMANIA

On the Estimation of the Large Reflection of a Cantilever Beam
Marcelo H Ang Jr., W. Wei, L. T. Seng, National University of Singapore, SINGAPORE

SESSION RV-07 Computer Vision II: Low Level Vision

Function-Oriented Chip Approach for Real-Time Vision
I. Masaki, Massachusetts Institute of Technology, USA

A Two-Step Approach to Detect Contours Formed by Sharp Intensity Changes
Y. T. Liow, AT&T Bell Laboratories, USA

Shape from Shading Using Genetic Algorithm
H. Saito, K. Usami, Keio University, JAPAN

Cutting Edge Sharpness Measurement Using Angle Limited Total Integrated Scattering
T. Wenyang, Harbin Institute of Technology, CHINA

Efficient Understanding of Color Image Sequence by Temporal Multiplexation
N. Nishikado, Y. Yaginuma, M. Sakauchi, University of Tokyo, JAPAN

Real-Time Adaptive Regulation of a Visual Camera for Automatic Investigation of Changing Environments
V. Murino, C. S. Regazzoni, University of Genova, ITALY

Shape Reconstruction from Shadow & Shading
P. S. Toh, W. L. Goh, K. L. Chan, Nanyang Technology University, SINGAPORE

Multilayer Back Propagation Network for Flexible Circuit Recognition
P. N. Suganthan, E. K. Teoh, D. P. Mital, Nanyang Technology University, SINGAPORE

SESSION RV-08 Kinematics and Dynamics of Robot Manipulator

Compensation of Trajectory Tracking Errors Introduced by Sampling in Computer Control Implementations of Model-Based Robot Control
Marcelo H Ang Jr., A. N. Poo, T. C. L. Teo, L. Qing, National University of Singapore, SINGAPORE

A Decoupling Control Scheme with Disturbance Rejection for Robot Manipulator
C. L. Teo, H. A. Zhu, G. S. Hong, A. N. Poo, National University of Singapore, SINGAPORE
SESSION RV-09  Computer Vision III: 3D Vision

Integrated Range Image Segmentation Using Connectionist Paradigm
S. Ghosal, R. Mehrotra, University of Kentucky, USA
Model Based 3D Object Recognition Using and Accurate Laser Range Finder
P. Lopes, E. Oliveira, University do Porto, PORTUGAL
Using and Active Vision System to Compute Time-Until-Impact
J. Dias, J. Batista, H. Araujo, A. T. de Almeida, University of Coimbra, PORTUGAL
Visual Feedback Control for Tracking and Intercepting 3D Moving Object
Ren C Luo, M. Baeg, F. Harashima, University of Tokyo, JAPAN
Three Dimensional Vision System for Intelligent Vehicles
I. Masaki, Massachusetts Institute of Technology, USA
Active Eye Sensing System
T. Oya, H. Hashimoto, F. Harashima, University of Tokyo JAPAN
Model-Based Robot Vision VLSI Processor for 3-D Instrumentation and Object Recognition
Y. Sasaki, M. Kameyama, Tohoku University, JAPAN
Acquisition of 3-D Image of Still or Moving Objects Utilizing Laser Diode Range-Finding Speedometer
S. Shinohara, T. Suzuki, H. Yoshida, H. Ikeda, Shizuoka University, M. Sumi, Chiba Institute of Technology, JAPAN
Concurrent Acquisition and Processing of Multi-Spectral Shadow Information for 3-Dimensional Machine Vision
W. S. Ching, P. S. Toh, Nanyang Technology University, SINGAPORE
Design of a Three-Dimensional Boundary Detector
Z. Shiming, M. Rajiv, University of Kentucky, USA

SESSION RV-10.1  Intelligent Sensors and Actuators II

Micro Finger Force Sensor Using Strain Gauge for Articulated Robot Hand
K. Kuribayashi, N. Oe, S. Shimizu, T. Taniguchi, YamaguchiUniversity, JAPAN
Development of Capacitance Type Micro Encoder
K. Kuribayashi, S. Shimizu, M. Horikawa, T. Taniguchi, Yamaguchi University, JAPAN
A Practical New Method for Multisensor Track-to-Track Association Technique
Y. Kosuge, M. Hayashi, K. Hiwatashi, Mitsubishi Elec. Corp., JAPAN
Switched Reluctance Actuator with Reduced Torque Ripple and Enhanced Controllability
L. Malesani, F. Leonardi, R. Speranza, A. Scandellari, University of Padova, ITALY
A Wide Angle Vision Sensor with Fovea - Design of Distortion Lens and the Simulated Images
Y. Suematsu, Nagoya University, JAPAN
Gloss Sensing System Using Spatial Filter with Multiresolution
S. Serikawa, T. Shimomura, Kyushu Institute of Technology, JAPAN
SESSION RV-10.2  Computer Vision IV: High Level Vision

Recognition of Multiple Objects Using Geometric Hashing Techniques ................................................................. 1779
J. Edwards, R. Shoureshi, Purdue University, USA

Real-Time Cooperative Image Processing for Interactive Environment Understanding .............................................. 1785
T. Hamada, K. Kamejima, M. Tsuchiya, Hitachi, Ltd., JAPAN

Visual Servoing of the Manipulator with the Stereo Vision ...................................................................................... 1791
N. Maru, H. Kase, A. Nishikawa, F. Miyazaki, Osaka University, JAPAN

Continuous Overlap Pursuit Method to Detect Moving Objects in Natural Scenes .................................................. 1797
Y. Fuwa, Y. Shimokawa, A. Inada, Toshiba Corp., JAPAN

Moving TV Image Analysis Based on Multimedia Fusion Focusing on Extracted Common Concepts .......................... 1803
Y. Yaginuma, M. Sakauchi, University of Tokyo, JAPAN

Development of An Electrostatic Linear Actuator by Micromachining Processes ...................................................... 1808
Y. Ohtsubo, H. Goto, S. Hashitera, K. Tajiri, S. Tadokoro, T. Takamori, K. Suzuki Kobe University, JAPAN

SESSION RV-11  Control of Robot Manipulator II

Nonlinear Adaptive Tracking and Stabilization of a Robot Manipulator ................................................................. 1814
A. S. C. Sinha, H. O. Yurtseven, Purdue University at Indianapolis, USA

Comparison of Two Adaptive Control Methods for Robotic Applications .............................................................. 1819
R. Araujo, G. Cook, George Mason University, USA

Real Time Control of Robot Manipulator Using a Neural Network Based Learning Controller ............................ 1825
S. P. Chan, Nanyang Technology University, SINGAPORE

Robustness of the Vibration Suppression Feedback Loop for Speed Control System ........................................... 1831
I. Godler, Harmonic Drive Sys., Inc., K. Ohnishi, Keio University, T. Yamashita, Kyushu Institute of Technology, JAPAN

Position Control using a Transputer Network for a Sensor Equipped Robot .......................................................... 1836
K. H. Kim, A. Kern, U. Kunz, University of Siegen, GERMANY

Application of Robust Indirect Adaptive-Control Methods in Task-Space Hybrid Manipulator Control ................ 1842
U. Nunes, R. Araujo, A. T. De Almeida, University de Coimbra, PORTUGAL

Development and Test of a New Advanced DSP Based Architecture for Robotics Drives Control .......................... 1848

SESSION RV-12  Computer Vision V: Visual Inspection

Vision System for On-line Surface Inspection in Aluminum Casting Process ........................................................ 1854
C. Fernandez, C. Platero, P. Campoy, R. Aracil, J. M. Sebastian, Politech University of Madrid, SPAIN

A Real-Time Vision System for Crowding Monitoring ......................................................................................... 1860
C. Regazzoni, V. Murino, A. Tesei, G. L. Foresti, University of Genova, ITALY

A Solder Joint Inspection System for Surface Mounted Pin Grid Arrays .............................................................. 1865
A. Kashitani, N. Takanashi, N. Tagawa, NEC Corp., JAPAN

A System for Automated Visual Inspection of Ceramic Tiles .............................................................................. 1871
G. S. Desoli, University of Genoa, ITALY

Final Visual Inspection System for LSI Packages ............................................................................................... 1877

Tampoprint Inspection by Artificial Vision .......................................................................................................... 1882
F. Truchetet, J. P. Cholley, S. Hemmings, University of Burgundy, FRANCE

Structure of Neural Networks for Industrial Character Reader ............................................................................ 1888
S. Hata, Kagawa University, K. Seino, Hitachi Keiyoh Eng., Ltd., A. Yagisawa, Hitachi Tohbu Semiconductor, JAPAN
SESSION RV-13  Robot Applications

Computer Simulation of a Robotic Golfer
O. P. Kreidl, M. L. Cooley, G. Cook, George Mason University, USA

Fault Tolerance for Modular Robots
T. Sabri, University of Texas at Austin, USA

Meeting Time Requirements in Robotics by a Fieldbus Communication System
S. Cavalieri, A. Di Stefano, O. Mirabella, University di Catania, ITALY

Magnetic Heads Loading in Disk Drive Assembly Using Rectangular Robot with Computer Visual Feedback
F. Mrad, S. Malck, E. Reid, IBM Adstar, USA

Object Recognition Using Ultrasonic Sensors in Robotic Applications
J. M. Perez Oriol, University de Cantabria, A. M. G. Gonzalez, S. Arnaltes, University Politech de Madrid, SPAIN

Applying the Nanometer Degree Capacitance Sensor to the Super-High-Precision Measurement of Roundness
J. Tan, D. Li, X. Qiang, W. Yang, Harbin Institute of Technology, CHINA

INVITED SESSION SPIS-01  Variable Structure Control Applications

Application Oriented Trends in Sliding Mode Control Theory
V.J. Utkin, Institute of Robotics and System Dynamics, GERMANY

On the Design of Variable Structure Controller
W.B. Gao, Beijing University of Aeronautics and Astronautics, CHINA

VSS Controller Design for Discrete-Time Systems
K. Furuta, Yaodong Pan, Tokyo Institute of Technology, JAPAN

Integral Augmented Variable Structure Control: Design and Testing
H. Tan, M. E. Green, J.Y. Hung Auburn University, USA

Variable Structure Robust Control by Fuzzy Logic and Stability Analysis for AC Drive System
M. Strefezza, A. Suyitno, Y. Dote, Muroran Institute of Technology, JAPAN

On Chatter Handling for Variable Structure Control System
J.C. Hung, University of Tennessee, USA

SESSION SP-01  Applications of Signal Processing and Control

Preliminary Design of the APS PID Global Orbit Control System
J. A. Kirchman, J. P. Bobis, Northern Illinois University, USA

Frequency Correction and Frequency Locked Loop for a Microcomputer Compensated Crystal Oscillator
F. J. Azcondo, P. P. Sanchez, University de Cantabria, J. Peire, Ciudad University, SPAIN

A Precise Analysis of the Phase Commutation for the Torque Nonlinear Control of a Switched Reluctance Motor-Torque Ripples Minimization
H. Cailleux, B. L. Pioufle, B. Multon, C. Sol, LESiR, FRANCE

An Induction Machine Servo with one Current Controller and an Improved Flux Observer
M. Alakula, A. Carlsson, Lund University of Technology, SWEDEN
An Artificial Vision System used in the Measurement of the Overhead Wire in Railway Applications .............................................................. 1997
Y. Torroja, S. Garcia, J. L. Aparicio, P. M. Martinez, University Politech de Madrid, SPAIN

A Quick Response Peak Detector for Variable Frequency Three-Phase Sinusoidal Signals ................................................................. 2003
C. T. Pan, M. C. Jiang, National Tsing Hua University, CHINA

Vibration Control of 2 Mass Resonant System by Resonance Ratio Control ................................................................. 2009
K. Yuki, T. Murakami, K. Ohnishi, Keio University, JAPAN

S. A. Dimino, Motorola Corp., R. J. Niederjohn, J. A. Heinen, Marquette University, USA

SESSION SP-02  Optimal Control I

The Application of Minimum Control Synthesis to web Tension and Transport Control .............................................................. 2019
D. P. Stoten, M. G. Dye, University of Bristol, UNITED KINGDOM

Internal Model Control Approach for Designing Disk Drive Servo-Controller ................................................................. 2024
T. H. Lee, T. S. Low, A. Al-Mamun, C. H. Tan, National University of Singapore, SINGAPORE

Chaotic Behaviors of a Two Revolute Joint Robot Controlled with a PD Algorithm ................................................................. *

On the Estimate of Robustness Bounds for Perturbed Time-Delay Systems ................................................................. 2028
C. H. Lee, T. H. S. Li, F. C. Kung, National Cheng Kung University, CHINA

A Robustness Enhancer for Model-Based Controllers .................................................................................................................. 2033
H. A. Zhu, C. L. Teo, G. S. Hong, National University of Singapore, SINGAPORE

Modeling and Robust Control of Flexible Solar Array Paddles .................................................................................................. 2039
M. Hatayama, Osaka University, F. Matsuno, Kobe University, Y. Sakawa, Osaka University, JAPAN

Modeling of a Time-Varying System Using Recursive Convolution .................................................................................... 2045
C. C. Wong, Royal Melbourne Institute of Technology, Australia

SESSION SP-03  Algorithms in Signal Processing and Control

Experiences of Recursive Identification Applied to Electric Machines .......................................................................................... 2049
I. Kamwa, IREQ, P. Viarouge, H. Le-Huy, Laval University CANADA

Security Constrained Dispatch Solutions Using the Gradient Projection Method of Optimization ......................................................... 2055
R. Sjoholm, A. J. Boye, University of Nebraska-Lincoln, USA

The Use of Transform Domain LMS Algorithm to Adaptive Equalization .................................................................................. 2061
E. F. Sang, H. G. Yeh, California State University, USA

Stability Analysis and Stabilizing Control Synthesis with Lyapunov's Second Method Directly on Bond Graphs of Non-Linear Systems .................................................................................................................. 2065
S. J. Junco, University Nacional de Rosario ARGEN Systems F. P. Estola, Technology Res. C. of Finland, FINLAND

New Method for the Decomposition of Mixed Phase Systems .................................................................................................. 2070
K. P. Estola, Electronic Laboratory Technical Research Centre of Finland, FINLAND

Order Determination Using the Squared Magnitude Response for a Linear System with a Time Delay .............................................. 2075
D. Zhou, L. Peirlinckx, L. V. Biesen, Vrije University Brussels, BELGIUM

A Method of Model Reduction Preserving Design Specification Parameters for a Class of Dynamic Systems .................................................. 2081
N. Ohse, Kyoto Institute of Technology, JAPAN

Optimal Model-following Control of Non-Minimum-Phase Singular Perturbation Systems .......................................................... 2087
T. H. S. Li, C. P. Cheng, National Cheng-Kung University, CHINA

Handwritten Word Recognition by Image Segmentation and Hidden Markov Models ................................................................. 2093
C. Olivier, M. Avila, P. Courtellemont, T. Paquet, Y. Le courtier, University of Rouen, FRANCE

The Application of MARIMA and Multi-Value Time Series Analysis in the Fault Diagnostic System of Main Diesel Engine ...*

xxix
SESSION SP-04  Control System Applications

Efficient Tourk Tippin and Minimation for Variable and Reluctance Motors ........................................ 2104
Hung J. Y., Auburn University, USA

Selected Sample and Hold Circuits for the Digital to Analog Conversion Process ..................................... 2110
F. G. Pavuza, T. Sommer, Technology University of Vienna, AUSTRIA

An Interface Specification Method for Industrial Processes ........................................................................... *
M. L. Benaissa, H. Ezzedine, J. C. Angue, University de Valenciennes et du Hainaut Cambresis, FRANCE

Application of CSP to the Development of Sequence Control Mechanisms .................................................. 2115
M. Tsujigado, Hakuh University, JAPAN

Magnetic Bearing Having PID Controller and Discontinuous Controller .................................................... 2121
T. Sato, Y. Tanno, Shinshu University, JAPAN

Printhead Carriage Transport High Speed Control System with Robust Compensator .............................. 2126
N. Iwazawa, T. Tsujisawa, S. Ishizaki, T. Hieda, NEC Corp., JAPAN

Development of an Electromechanical Active-Cab-Suspension ................................................................... 2132
T. Inaba, Tokyo Institute of Technology, T. Hiromatsu, Isuzu Motors Ltd., Y. Matsumoto, Tokyo Institute of Technology, JAPAN

Internal Structure of Two-Degree-of-Freedom Controller and Its Applications to Vibration Suppression Control .................................................................................................................... 2138
T. Ogawa, T. Suzuki, K. Matsumoto, S. Okuma Nagoya University, K. Kamiyama Utsunomiya University, K. Ohno Hitachi Ltd., JAPAN

SESSION SP-05  Nonlinear Control I

A New Class of Adaptive Control Laws for Rigid Robots ............................................................................... 2144
C. Y. Su, Y. Stepanenko, University of Victoria, CANADA

Identification and Control of Non-Linear Plants Using Welsh Functions ...................................................... 2149
D. P. Stoten, J. Harkness, Bristol University, UNITED KINGDOM

Adaptive Input-Output Linearization of a Switched Reluctance Motor for Torque Control ......................... 2155
L. B. Amor, Ecole polytech de Montreal, L. A. Dessaint, O. Akhrif, Ecole de tech superieure, G. Olivier, Ecole Polytech de Montreal, CANADA

Design of a Time Optimal Variable Structure Controller for a Disk Drive Actuator ..................................... 2161
S. Weerasooriya, T. S. Low, A. Al-Mamun, National, University of Singapore, SINGAPORE

A Slip Frequency Gain Adaptation Method Based on MRAS for Induction Motor Drives .............................. 2166
R. Regnauto, J. E. N. Rocco, Federal University of Santa Catarina, BRAZIL

Variable Structure Model Reference Adaptive Control Using Only Input and Output Measurements for Two Real One-Link Manipulators ......................................................................................... 2171

A Gain-Adaptive Scheme for the Generalized Predictive Control of an Air-Handling Plant ...................... 2178
G. Geng, G. M. Geary, University of Durham, UNITED KINGDOM

Analysis and Control of Moving Coil Electrodynamics Shakers .................................................................... 2184
H. M. Macdonald, T. C. Green, B. W. Williams, Heriot-Watt University, UNITED KINGDOM
### SESSION SP-06  Optimal Control II

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delayed Model Following for Nonminimum Phase Plants</td>
<td>2190</td>
</tr>
<tr>
<td>K. Ichikawa, Sophia University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>Robust Stabilization of Large-Scale Interconnected Systems Including Delayed Perturbations</td>
<td>2195</td>
</tr>
<tr>
<td>H. Wu, K. Mizukami, Hiroshima University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>Robust Control Using Predictor in Polynomial Fraction Techniques</td>
<td>2201</td>
</tr>
<tr>
<td>K. Ichikawa, Sophia University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>An Analysis of Time Optimal Control Problem for One Dimensional Rotating Arm Using a Path Parameter</td>
<td>2206</td>
</tr>
<tr>
<td>M. Yamamoto, A. Mohri, Kyushu University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>A Design Method of Generalized Minimum Variance Controller for Tracking Reference with Ramp Input</td>
<td>2212</td>
</tr>
<tr>
<td>H. Tanaka, H. Fujikawa, S. Yamada, Musashi Institute of Technology, JAPAN</td>
<td></td>
</tr>
<tr>
<td>Optimal Regional Poles Placement with Time-Weighted Performance Index</td>
<td>2218</td>
</tr>
<tr>
<td>T. T. Lee, J. L. Wu, National Taiwan Institute of Technology, CHINA</td>
<td></td>
</tr>
<tr>
<td>Optimal Control of a Batch Fermentation Process</td>
<td>2224</td>
</tr>
<tr>
<td>L. Tan, Dublin City University, Z. Wang, Nanjing Chemical Industries Group Co., IRELAND</td>
<td></td>
</tr>
<tr>
<td>Modelling and Identification Techniques for Optimal Control of a Non-Linear Biotechnical Process</td>
<td>2224</td>
</tr>
<tr>
<td>L. Tan, Dublin City University, Z. Wang, Nanjing Chemical Industries Group Co., IRELAND</td>
<td></td>
</tr>
</tbody>
</table>

### SESSION SP-07  DSP

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extensible Digital-Signal-Processing Modules for Real Time Control and Simulation</td>
<td>2229</td>
</tr>
<tr>
<td>Y. Guo, H. C. Lee, B. T. Ooi, McGill University, CANADA</td>
<td></td>
</tr>
<tr>
<td>Generating Multiprocessor Algorithm Implementations from Task Precedence Graphs</td>
<td>2235</td>
</tr>
<tr>
<td>L. A. Reeves, M. Farooq, Royal Military College of Canada, CANADA</td>
<td></td>
</tr>
<tr>
<td>Design of a PC-Based Intelligent Instrument for Electrical Drives Testing</td>
<td>2241</td>
</tr>
<tr>
<td>B. Jin, Shanghai University of Technology, CHINA</td>
<td></td>
</tr>
<tr>
<td>Multifrequency Parallel Signal Transmission for Use in New Optical GPIB</td>
<td>2247</td>
</tr>
<tr>
<td>Y. Wu, H. Ikeda, H. Yoshida, S. Shinohara, Shizuoka University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>The Development of an Outline Image Processor</td>
<td>2251</td>
</tr>
<tr>
<td>S. Kurono, Kyushu Sangyo University, S. Aramaki, Kinki University in Kyushu, JAPAN</td>
<td></td>
</tr>
<tr>
<td>On Regularization for Image Restoration Problems From the Viewpoint of a Bayesian Information Criterion</td>
<td>2257</td>
</tr>
<tr>
<td>Nakano, M. Eguchi, Fukuoka Institute of Technology, Y. Toyota, Kyuki Elec. Corp., S. Sagara, Fukuoka Institute of Technology, JAPAN</td>
<td></td>
</tr>
<tr>
<td>A New Type Hypermedia Platform for Industrial Applications</td>
<td>2262</td>
</tr>
<tr>
<td>T. Satou, M. Sakauchi, University of Tokyo, JAPAN</td>
<td></td>
</tr>
<tr>
<td>Image Magnification by Using Spectrum Extrapolation</td>
<td>2266</td>
</tr>
<tr>
<td>K. Aoyama, R. Ishii, Yokohama National University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>Vibration Signal Analysis of Automobiles Based on Nonstationary Spectrum</td>
<td>2272</td>
</tr>
<tr>
<td>A. Fukasawa, Y. Takizawa, T. Sato, Oki Electric, JAPAN</td>
<td></td>
</tr>
<tr>
<td>DSP-based Self-Tuning IP Speed Controller for Rolling Mill DC Drive</td>
<td>2276</td>
</tr>
<tr>
<td>J. K. Ji, S. K. Sul, M. H. Park, Seoul National University, KOREA</td>
<td></td>
</tr>
</tbody>
</table>

### SESSION SP-08  Fuzzy/Neural Control

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Robust Fuzzy Control for a Class of Dynamic Systems with Unmeasurable Disturbances</td>
<td>2282</td>
</tr>
<tr>
<td>B. H. Xu, Hiroshima University, JAPAN</td>
<td></td>
</tr>
<tr>
<td>Learning Friction Compensation in Robot Manipulators</td>
<td></td>
</tr>
<tr>
<td>S. P. Chan, Nanyang Technology University, SINGAPORE</td>
<td></td>
</tr>
</tbody>
</table>
Design and Convergence of Neural Network-based Self-tuning Regulator for Partially Known Nonlinear Dynamical System

B. Bae, Z. Bien, Korea Adv. Institute of Sci., KOREA

A Design Method of MRACS with Fuzzy Adaptive Control Rules Using Genetic Algorithms
T. Suzuki, K. Shida, H. Fujikawa, S. Yamada, Musashi Institute of Technology, JAPAN

A Simple Design Method for Sampled-data I-PD Control Systems
K. Suyama, Tokyo University of Mercantile Marine, JAPAN

Multivariable Control of Interstand Tension and Exit Height of the Material for Bar and Wire Rod Rolling
Y. Noguchi, K. Okamura, H. Ogai, Y. Naganuma, Nippon Steel Corp., JAPAN

Discrete-Time Learning Control for Robotic Manipulators Based on 2-Delay Input Method
S. Hayakawa, M. Kondo, T. Suzuki, S. Okama, Nagoya University, JAPAN

Neuro Fuzzy Robust Controllers for Drive Systems
Y. Dote, Y. Fujino, A. Suyitno, Muroran Institute of Technology, JAPAN

SESSION SP-09 Nonlinear Control II

Software Based Speed Control of Nonlinear DC Drive with Sliding Mode/Variable Structure Approach
M. P. S. Chawla, K. S. Mehta, C. V. Abroal, B. Sarkar, SGS Institute of Technology and Sci., INDIA

Nonlinear Control System for a Nonlinear Time-Varying Plant
M. Uchida, H. Nakamura, Bailey Japan Co., Ltd., Y. Toyota, Kyushu Denki-seizo Co., Ltd., JAPAN

Model Reference Adaptive Control for Distributed Parameter Systems by Finite Dimensional Controllers
S. Yamada, H. Fujikawa, T. Yoneyama, K. Hayakawa, Musashi Institute of Technology, JAPAN

Digital Stabilization of Nonlinear Time-Delay Systems and its Robustness
T. Asakura, Fukui University, B. Xu, S. Okabe, Y. Kamiya, Kanagawa University, JAPAN

Experiments Toward Chattering-Alleviated Discretized Variable Structure Controller Design of a Brushless Servo System
J. S. Chen, C. M. Zhao, National Tsing Hua University, CHINA

Sliding-Mode Observers Design for Singular Perturbation Systems
M. S. Wang, T. H. S. Li, Y. Y. Sun, National Cheng-Kung University, CHINA

Nonlinear Feedback Model Attitude Control Using CCD in Magnetic Suspension System
C. E. Lin, A. S. Hou, Cheng Kung University, CHINA

SESSION SP-10 Estimation and Measurement

Microprocessor Based System for the Detection and Characterization of Acoustic Emissions for Materials
Bettinger D. D., Tront J. G., Virginia Polytech Institute & State University, USA

Cascade Pseudo Derivative Feedback Control Algorithm and its Application to Design of Autopilots
A. Vahedipour, J. P. Bobis, Northern Illinois University, USA

Evaluating Method for the Printing Quality of the printing System Installed with Computer
T. Muraoaka, Hamamatsu Polytechnic College, Y. Shimodaira, H. Ikeda, Shizuoka University, T. Yugami, NEC Field Service, Ltd., JAPAN

Automatic Measurement of Ship’s Attitude by Use of Servo-Type Accelerometers
S. Tanaka, S. Nishifuji, Yamaguchi University, JAPAN

A Unique Monitoring Approach for High Strength Polymer Manufacturing System
W. S. Lau, L. Yingjie, Hong Kong Polytecknic, HONG KONG

Estimation of One-Dimensional Radar Tracking Via Fuzzy-Kalman Filter
T. H. S. Li, National Cheng-Kung University, CHINA
Direct Estimation of Physical Parameters for a Class of Multivariable Mechanical Systems .................................................................*  
M. Eguchi, K. Nakano, Fukuoka Institute of Technology, K. Wada, Kyushu University, S. Sagara,  
Fukuoka Institute of Technology, JAPAN

Laser Beam Printer Adjustment by Use of Subjective Evaluation Pattern .................................................................2389  
Y. Shimodaira, M. Takahashi, Shizuoka University, T. Muraoka, Hamamatsu Polytechnic College, H. Ikeda,  
Shizuoka University, T. Yugami, NEC Field Ser., Ltd., JAPAN

Symbolic and Numerical Models Based Decision-Making Systems .................................................................*  
J. T. Wang, D. P. Mital, E. K. Teoh, Nanyang Technology University, SINGAPORE

The Measurement of Aircraft Electrical Power Supply System Parameters .................................................................*  
W. Lin, G. Yuqi, S. Yandong, M. Chunting, Northwestern Polytech University, CHINA