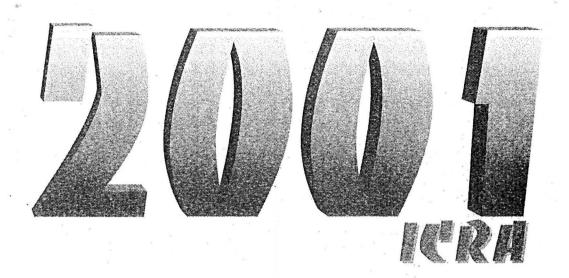
2001 IEEE International Conference on Robotics and Automation (V.2)(V.A)

TP242-53 R666 2001

Proceedings



IEEE International Conference on Robotics and Automation

May 21~26, 2001 COEX Seoul, Korea



Sponsored by
IEEE Robotics and Automation Society

Volume II

Pages 1053-2158



ICRA2001 PROCEEDINGS

Additional copies may be ordered from:

IEEE Service Center 445 Hoes Lane P.O. Box 1331 Piscataway, NJ 08855-11331 U.S.A.

IEEE Catalog Number 01CH37164
ISBN 0-7803-6576-3
ISBN 0-7803-6577-1 (Microfiche)
Library of Congress Catalog Number 90-640158
ISSN 1050-4729
IEEE Catalog Number (CD-ROM): 01CH37164C
ISBN 0-7803-6578-X (CD-ROM)

Copyright and Reprint Permission:

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 republication permission, write to IEEE Copyrights Manager, IEEE Operations Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. All rights reserved. Copyright ©2001 by the Institute of Electrical and Electronics Engineers, Inc.

Printed in Korea by Kyung Hee Information Printing Co., Ltd.

The Institute of Electrical and Electronics Engineers, Inc.

Foreword

The 2001 IEEE International Conference on Robotics and Automation will be held in Seoul, the capital city of Korea. This is the fourth conference to be held outside the USA, and the second to be held in Asia. Seoul is the economic and cultural center of Korea, and offers a unique setting combining tradition and modernism for a conference on high technology.

We are witnessing the beginning of the new millennium, and the theme of this conference reflects the timely objective, "Frontiers of Robotics and Automation in the New Millennium". This conference will provide an opportunity to promote new emerging concepts in robotics and automation technology.

A record number of papers totaling over 1150 have been submitted to the program committee, by authors from more than 50 countries. Of these, 678 papers were selected for presentation at the conference. Geographically, the accepted papers come in roughly equal proportions from North America, Europe, and Asia.

The conference will be running in 13 parallel sessions with three plenary speeches and two panel discussions. The scope of the plenary speeches ranges from medical robotics and machine tool technologies to nano-robotics. We will also have panel discussions on manufacturing automation and rehabilitation robotic systems. We believe these topics will surely be critical issues for the future robotics community.

A number of special efforts were made in the preparation of this conference. For the first time in the history of this conference, an on-line electronic system was used to handle paper submissions, reviews, and registration. This contributed greatly in eliminating paperwork and communication delays. The conference will be held at the same time with KOFA2001, a full-scale annual exhibition on factory automation. A series of workshops and symposiums related to robotics and automation were also scheduled around the conference dates, to enable participants to attend more than one meeting while attending ICRA2001. Special sessions on Korean industrial automation have been scheduled during the conference in order to provide an opportunity for visitors to become acquainted with the local robotics and automation activities. These special sessions will focus on technology developments in automation of the automobile industry, semiconductor industry, and steel industry in Korea.

We are very grateful for all the hard work of many people and would like to express the deepest thanks to all the supporting organizations.

All the best,



Wook Hyun Kwon General Chairman



Beom Hee Lee Program Chairman

ICRA2001 Organization

A. Advisory Committee

Steve Hsia, University of California, USA
Myoung Sam Ko, Seoul National University, Korea
Fumio Harashima, Tokyo Metropolitan Institute of Technology, Japan
Tzyh-Jong Tarn, Washington University, USA
Norman Caplan, Washington University, USA
C.S. George Lee, Purdue University, USA

B. Organizing Committee

General Chair Wook Hyun Kwon, Korea

General Co-Chairs Arthur Sanderson, USA Paolo Dario, Italy Toshio Fukuda, Japan

General Vice-Chair Hyung Suck Cho, Korea

Local Arrangements Chair Sang-Rok Oh, Korea

Tutorials and Workshops Chair Sukhan Lee, Korca

Video Proceedings Chair Wankyun Chung, Korea

Publications Chair Myung Jin Chung, Korea

Finance Chair Jin Young Choi, Korea Program Chair
Beom Hee Lcc, Korea

Program Co-Chairs
Junku Yuh, USA
Li-Chen Fu, ROC
Hideki Hashimoto, Japan
Ruediger Dillmann, Germany
Il Hong Suh, Korea

Program Vice-Chairs Myoung Hwan Choi, Korea Dae Won Kim, Korea Sooyong Lee, USA

Publicity Chair Jachyun Park, Korea

Publicity Co-Chair Shigeki Sugano, Japan

Exhibition Chair Chongwoo Park, Korea

C. Program Committee

Program Chair

Program Co-Chairs

Beom Hee Lee

Junku Yuh, Li-Chen Fu, Hideki Hashimoto, Ruediger Dillmann Il Hong Suh

Program Vice Chairs

Myoung Hwan Choi, Dae Won Kim, Sooyong Lee

Asia/Oceania

Fumihito Arai Yoshikazu Arai Suguru Arimoto Minoru Asada Zeungnam Bien Shi-Chung Chang Dongwoo Cho Hye-Kyung Cho Young-Jo Cho Jin Young Choi Myung Hwan Choi Hong Tae Chun Myung Jin Chung Wan Kyun Chung Teruo Fujii Masahiro Fujita In-Joong Ha Woonchul Ham Shigeo Hirose Katsushi Ikeuchi Hidenori Ishihara Koji Ito Ray Austin Jarvis MuDer Jeng Scul Jung

Jin Oh Kim Jong-Hwan Kim Jongwon Kim Munsang Kim Myung-Soo Kim Sungbok Kim Hiroshi Kimura Hyeong-Scok Ko Nak-Yong Ko Kiyoshi Komoriya Kazuhiro Kosuge Tae-Yong Kuc Yoshinori Kuno In So Kweon Dong-Soo Kwon Jang-Myung Lee Jin S. Lee Ju-Jang Lee Ki-Dong Lee Suk Gyu Lee Ser Yong Li Joonhong Lim Ren C. Luo

Takafumi Matsumaru Hirofumi Miura Seungbin Moon Yoshihiko Nakamura Boo Hee Nam Y. Narahari

Sang-Rok Oh Toru Omata Jun Ota Chongkug Park Gwi Tae Park Jachyun Park Jong Hyeon Park Jong-Oh Park Hong Qiao Akihito Sano Homayoun Seraji Yoshiaki Shirai Kwec-Bo Sim Shigeki Sugano Il Hong Suh Atsuo Takanishi Toshio Tsuji Masaru Uchiyama Michael Yu Wang Seiji Yamada Yoshio Yamamoto Byung-Ju Yi Kazuhito Yokoi Yasuyoshi Yokokohji Kyung Hyun Yoon Kazuya Yoshida Tsuneo Yoshikawa Bum-Jae You Shin'ichi Yuta

Europe/Mediterranean

Makoto Kaneko

Kazuo Kiguchi

DaeWon Kim

Hakil Kim

Hassane Alla
Antonio Biechi
John Billingsley
Martin Buss
Maria Chiara Carrozza
Jose Angel Castellanos
Raja Chatila
Ruediger Dillmann

Eckhard Freund Volker Graefe Gerd Hirzinger Radu Horaud Wisama Khalil Heikki Koivo Krzysztof Kozlowski Christian Laugier Jean-Paul Laumond Alessandro De Luca Jean-Pierre Merle Francois Pierrot Juergen Rossmann Alberto Rovetta Imre J. Rudas Guenther Schmidt Bruno Siciliano Stefano Stramigioli Karim A. Tahboub Spyros Tzafestas

America

Sunil K. Agrawal Jorge Angeles Tucker Balch Antal K. Beiczy Beno Benhabib Wayne J. Book John Canny C. L. Philip Chen Yilong Chen Gregory S. Chirikjian Howie Choset James J. Clark Alan A. Desrochers Rajiv Dubev Khaled M. Ellcithy Ronald S. Fearing Bijoy K. Ghosh Maria Gini Andrew Goldenberg William A. Gruver Kamal Gupta Vincent Hayward John M. Hollerbach Roberto Horowitz Seth Hutchinson

Youcef-Toumi Kamal Lydia Kavraki Pradeep K. Khosla Antti J. Koivo David J. Kriegman Andrew Kusiak David Lane C.S. George Lee Kok-Meng Lee Sooyong Lee Ming C. Lin J.Y.S(John) Luh Peter B. Luh Vladimir Lumelsky Anthony Maciejewski Constantinos Mavroidis Max O.-H. Meng Bradley J. Nelson Paul Oh David E. Orin Nikos Papanikolopoulos Lynne E. Parker Gordon Robert Pennock Nancy S. Pollard Alfred A. Rizzi

Bernard Roth Daniela Rus Arthur C. Sanderson Nilanjan Sarkar Zvi Shiller Reid G. Simmons Wesley E. Snyder Tarek M. Sobh Harry E. Stephanou Tzyh-Jong Tarn Russell H. Taylor Jeffrey C. Trinkle N. Viswanadham Richard M. Voyles Kenneth J. Waldron Ian D. Walker Louis L. Whitcomb Peter Will Ning Xi Woosoon Yim Junku Yuh Yuan F. Zheng MengChu Zhou

D. Video Proceedings Committee

Video Proceedings Committee Chair Wankyun Chung

Video Proceedings Committee Members

Rajiv Dubey, USA
Jin-oh Kim, Korca

Kazuhito Yokoi, Japan Dragomir N. Nenchev, Japan Giorgio Cannata, Italy



| SESSION: WA01 Motion Planning | |
|---|------|
| Planning Motion Patterns of Human Figures Using a Multi-layered Grid and the Dynamics Filter Shiller, Zvi and Yamane, Katsu and Nakamura, Yoshihiko | |
| Extending Procedural Reasoning toward Robot Actions Planning | |
| Let's reduce the Gap between Task Planning and Motion Planning | |
| An Adaptive Framework for 'Single Shot' Motion Planning: A Self-tuning System for Rigid and Articulated Robots | 21 |
| Vallejo, Daniel and Remmler, Ian and Amato, Nancy M. Optimal Line-sweep-based Decompositions for Coverage Algorithms | 27 |
| Huang, Wesley H. Global Nearness Diagram Navigation (GND) | |
| Minguez, Javier and Montano, Luis and Simeon, Thierry and Alami, Rachid | |
| SESSION: WA02 Petri Nets and Related Methods in Agile Automa | tion |
| Combining Fault Detection and Process Optimization in Manufacturing Systems Using First-order Hybrid Petri Nets Balduzzi, Fabio and Di Febbraro, Angela | 40 |
| A Petri Net Graphic Method of Reduction Using Birth-death Processes Zemouri, Ryad A and Racoccanu, Daniel I and Zerhouni, Noureddine | 46 |
| Modeling and Analysis of Semiconductor Manufacturing Systems with Degraded Behaviors Using Petri Nets and Siphons Jeng, MuDer and Xie, Xiaolan | 52 |
| Developing Software Controllers with Petri Nets and a Logic of Actions | 58 |
| Resource-oriented Petri Nets in Deadlock Avoidance of AGV Systems | |
| Algebraic Deadlock Avoidance Policies for Conjunctive / Disjunctive Resource Allocation Systems Park, Jonghun and Reveliotis, Spyros A. | 70 |
| SESSION: WAO3 Control for Dextrous Manipulation | |
| On a Two-level Hierarchical Structure for the Dynamic Control of Multifingered Manipulation | 77 |
| Robust Manipulation of Deformable Objects by a Simple PID Feedback | 85 |

| Oriolo, Giuseppe and Vendittelli, Marilena | 91 |
|---|---------------------------|
| Robotic Pinching by Means of a Pair of Soft Fingers with Sensory Feedback | 97 |
| Fast Dextrous Regrasping with Optimal Contact Forces and Contact Sensor-based Impedance Control Schlegl, Thomas and Buss, Martin and Omata, Toru and Schmidt, Guenther | 103 |
| DLR-hand II: Next Generation of a Dextrous Robot Hand | 109 |
| | |
| ESSION: WA04 Micromanipulation and Microsystems | E SERVICE CONTRACTOR - IN |
| Micromanipulation Using a Friction Force Field Sin, Jeongsik and Winther, Tobias and Stephanou, Harry | 115 |
| On the Coarse/Fine Dual-stage Manipulators with Robust Perturbation Compensator Kwon, Sangloo and Chang, Wan Kyun and Youn, Youngil | 121 |
| Development of Global Vision System for Biological Automatic Micro-manipulation System | 127 |
| A Flexible Experimental Workcell for Efficient and Reliable Wafer-level 3D Microassembly | 133 |
| Mechanical Micro-dissection by Microknife Using Ultrasonic Vibration and Ultra Fine Touch Probe Sensor Arai, Fumilito and Amano, Takaharu and Fukuda, Toshio and Satoh, Hiroshi | r 139 |
| Design and Analysis of an Electromagnetically Driven Valve for a Glaucoma Implant Bac, Byunghoon and Kim, Nakhoon and Kee, Hongseok and Kim, Sconho and Lee, Yeon and Park, Kyihwan | 145 |
| | |
| ESSION: WA05 Trajectory Generation & Control | |
| A Path Generation Algorithm of Autonomous Robot Vehicle Through Scanning of a Sensor Platform Park, Tong-Jin and Han, Chang-Soo | 151 |
| Hybrid Control of Formations of Robots | 157 |
| Tracking Control of a Mobile Robot Using a Neural Dynamics Based Approach Yuan, Guangfeng and Yang, Simon X. and Mittal, Gauri S. | 163 |
| Backward Line Tracking Control of a Radio-controlled Truck and Trailer Aliafini, Claudio and Speranzon, Alberto | 169 |
| The Scalar Epsilon-controller: A Spatial Path Tracking Approach for ODV, Ackerman, and Differentially-steered Autonomous Wheeled Mobile Robots Davidson, Morgan E and Balıl, Vikas | 175 |
| Normalized Energy Stability Margin and its Contour of Walking Vehicles on Rough Terrain Hirose, Shigeo and Tsukagoshi, Hideyuki and Yonoda, Kan | 181 |

| apagiou www. | | |
|--|--|----------------------------|
| SESSION: WA06 Programming Architecture | | |
| Creating the Architecture of a Translator Framework for Robot Programming Languages | | 187 |
| A Multi-processing Software Infrastructure for Robotic Systems | | 193 |
| Open Real-time Interfaces for Monitoring Applications within NC-control Systems | | 199 |
| Robot Behavior Engineering Using DD-designer | | 205 |
| Object-oriented Design Pattern Approach for Modeling and Simulating Open Distributed Control Tomura, Toyoaki and Kanai, Satoshi and Uchiro, Kiyoshi and Yamamoto, Susumu | System | 211 |
| Implementation of Internet-based Personal Robot with Internet Control Architecture | | 217 |
| | | 1. |
| SESSION: WA07 Visual Servoing Experimetal Issues | | |
| Computer Animation: A New Application for Image-based Visual Servoing | | 223 |
| Design and Implementation of Visual Servoing System for Realistic Air Target Tracking | | 229 |
| Robust Visual Servoing: Examination of Cameras Under Different Illumination Conditions | | 235 |
| Asymptotic Motion Control of Robot Manipulators Using Uncalibrated Visual Feedback | | 241 |
| Image-based Visual Servoing on Planar Objects of Unknown Shape | | 247 |
| Localization of a Mobile Robot Using Images of a Moving Target | | 253 |
| | | |
| SESSION: WA08 Mobile Robot | | |
| Extracting Navigation States from a Hand-drawn Map | | 250 |
| Skubic, Marjorie A and Matsakis, Pascal and Forrester, Benjamin and Chronis, George | , | 259 |
| On Eye-sensor Based Path Planning for Robots with Non-trivial Geometry/Kinematics | | 265 |
| Optimizing Schedules for Prioritized Path Planning of Multi-robot Systems | | 271 |
| Autonomous Characterization of Unknown Environments | | 277 |
| Towards a Meta Motion Planner A: Model and Framework | | 285 |
| | 200 TO 100 TO 10 | CONTRACTOR OF THE PARTY OF |

| Towards a Meta Motion Planner B: Algorithm and Applications | 291 |
|---|-----|
| | |
| SESSION: WA09 Flexible Automation (I) | |
| Efficient Scheduling of Behavior-processes on Different Time-scales Birk, Andreas and Kenn, Holger | |
| An Efficient Depalletizing System Based on 2D Range Imagery Katsoulas, Dimitrios K and Kosmopoulos, Dimitrios I | 305 |
| Automatic Generation of Assembly Instructions Using STEP Mok, Swee M. and Ong, Kenlip and Wu, Chi-haur | 313 |
| Furniture Polishing Robot Using a Trajectory Generator Based on Cutter Location Data | 319 |
| Force-guided Assemblies Using a Novel Parallel Manipulator | 325 |
| Path Planning for Robot-assisted Grinding Processes | 331 |
| SESSION: WA10 Control and Mechanism for Production Systems | |
| Data Filtering and Regression in Estimating Slew Motion Timing Model | 337 |
| An Exact Representation of Effective Cutting Shapes of 5-Axis CNC Machining Using Rational Bezier and B-Spline Tool Motions Xia, Jun and Gc, Q. Jeffrey | 342 |
| Design of Programmable Passive Compliance Shoulder Mechanism Okada, Masafumi and Nakamura, Yoshihiko and Ban, Shigeki | 348 |
| Kinematic Control of Parallel Robots in the Presence of Unstable Singularities | 354 |
| Complex Behaviors from Local Rules in Modular Self-reconfigurable Robots | 360 |
| Control of a Suspended Load Using Inertia Rotors with Traveling Disturbance | 368 |
| SESSION: WA11. Haptic Devices and Teleoperation | |
| Variable Position Mapping Based Assistance in Teleoperation for Nuclear Cleanup | |
| Human-centered Scaling in Micro-teleoperation | 380 |
| Haptically Augmented Teleoperation Turno Nicolas and Khatib, Oussama and Coste-Manicre, Eve | 386 |

| Elements of Telerobotics Necessary for Waste Clean Up Automation | 393 |
|--|-----|
| Design and Implementation of Remotely Operation Interface for Humanoid Robot | 401 |
| Model-based Teleoperation of a Space Robot on ETS-VII Using a Haptic Interface | 407 |
| SESSION: WA12 Space and Underwater Robotics | |
| Analysis on Impact Propagation of Docking Platform for Spacecraft | |
| Flyaround Maneuvers on a Satellite Orbit by Impulsive Thrust Control | 421 |
| Nonlinear Control Methods for Planar Carangiform Robot Fish Locomotion | |
| Quaternion-based Kinematic Control of Redundant Spacecraft/Manipulator Systems | 435 |
| Zero Reaction Maneuver: Flight Velification with ETS-VII Space Robot and Extension to Kinematically Redundant Arm | 441 |
| A Novel Adaptive Control Law for Autonomous Underwater Vehicles | 447 |
| SESSION: WA13 New Tools for Personal Robotics | |
| Ethological Modeling and Architecture for an Entertainment Robot | |
| Human-like Robot Head that has Olfactory Sensation and Facial Color Expression | 459 |
| Acquiring Hand-action Models by Attention Point Analysis | 465 |
| New Architecture for Mobile Robots in Home Network Environment Using Jini Lec, Byoung-Ju and Lec, Hyun-Gu and Lec, Joo-Ho and Park, Gwi-Tae | 471 |
| Implementing Tolman's Schematic Sowbug: Behavior-based Robotics in the 1930's Endo, Yoichiro and Arkin, Ronald C. | 477 |
| Generating Linguistic Spatial Descriptions from Sonar Readings Using the Histogram of Fo Skubic, Marjorie A. and Chronis, George and Matsakis, Pascal and Keller, James | |
| SESSION: WP01 Robot Learning | |
| Real-time Robot Learning | |

| | | | a . | |
|---|--|---|-------------------|-----|
| | | | | |
| | | | | |
| Learning Task-relevant Features from Vlassis, Nikos and Burschoten, Roland at | Robot Data | | | 499 |
| | | | | 6 |
| Autonomous Learning Algorithm and Kojima Kazuliro and Ito, Koji | Associative Memory for | Intelligent Robots | X | 505 |
| Learning Hierarchical Partially Observation of the Charles of the Computer of | vable Markov Decision Pr , Khashayar and Mahadevan, : | rocess Models for Rok Sridhar | oot Navigation : | 511 |
| Towards Automatic Shaping in Robot | t Navigation | *************************************** | | 517 |
| Peterson, Fold S. and Owens, Nancy E. | and Carroll, James L. | | | 317 |
| Obstacle Avoidance Learning for a M Daisuke, Itjima and Wenwei, Yu and Him | fulti-agent Linked Robot i oshi, Yokoi and Yukinori, Kal | in the Real World | | 523 |
| SESSION: WF02 | Discrete Event Mar | nufacturing System | s (I) | |
| Parformance Modeling of Supply Cha | The second secon | Marie Committee of the | | |
| Performance Modeling of Supply Cha Viswanadham, N and Raghayan, N. R. Sr | inis Osing Queueing Netv inivasa | vorks | | 529 |
| Dynamic Scheduling Rule Selection for Hisch, Bo-Wei and Chang, Shi Chang and | or Semiconductor Wafer | Fabrication | | 535 |
| A Deadlock Prevention Policy for Fle: Huang, YiSong and Jong, MaDer and Xio | xible Manufacturing Syste , Xiaolan and Chung, Shengta | ems Using Siphons | | 541 |
| An Effective Search Strategy for Waf- Lin, Ming-Hung and Fu, Li-Chen | er Fabrication Scheduling | with Uncertain Proce | ss Requirements . | 547 |
| Model-based Control for Reconfigurab Ohashi, Kazushi and Shin, Kang G. | ole Manufacturing System | S | | 553 |
| Design of Reconfigurable Semiconduc Tang, Ying and Zhou, MengChu | ctor Manufacturing System | ns with Maintenance a | and Failure | 559 |
| SESSION: WP03 | Sensing for Dextrou | s Manipulation | | |
| Dynamic Contact Sensing of Soft Plan | | | | |
| Kineshita, Genichiro and Kurimoto, Yujin | and Osumi, Hisashi and Umed | la, Kazunori | •••••• | 565 |
| Interpretation of Force and Moment S Newman, Wyatt S. and Zhao, Yonghong a | signals for Compliant Peg- and Pao, Yoh-Han | in-hole Assembly | | 571 |
| Dome Shaped Touch Sensor Using P Arai, Fumilito and Pukuda, Toshio and Re | PZT Thin Film made by F pigawa, Kouichi and Thukahara | lydrothermal Method i, Yasunori | | 577 |
| Heuristic Vision-based Computation of Morales, Autonio and Recatala, Gabriel and | Planar Antipodal Grasps d Sanz, Pedro J. and Pobil, A | on Unknown Objects ngel P. del | | 583 |
| Feature-guided Exploration with a Rob Okaniura, Allison M. and Cutkosky, Mark | ootic Finger | | | 589 |
| Identification of Contact Conditions fro Mouri, Tersuya and Yamada, Takayoshi an | m Contaminated Data of d Iwai, Ayako and Minura, N | Contact Force and M | oment | 597 |

| SESSION: WP04 Nano / Micro Robotics | |
|--|-------------|
| Three-dimensional Bio-micromanipulation Under the Microscope | |
| Arai, Furnihito and Kawaji, Akiko and Luangjarmekorn, Poom and Fukuda, Toshio and Itoigawa, Kouichi | 604 |
| Force Control System for Autonomous Micro Manipulation | 610 |
| Tanikawa, Tamio and Kawai, Mesashi and Koyachi, Noriho and Arai, Tatsuo and Ide, Takayuki and Kaneko, Shinji and Ohta, | Ryo |
| Micro Fluid Device Using Thick Layer Piezo Actuator Prepared on Si Micro-machined Structure Lee, Sukhan and Chung, Jacwoo and Lim, Scungmo and Lee, Changseung | |
| Microrobotic Cell Injection | 620 |
| Force Feedback-based Microinstrument for Measuring Tissue Properties and Pulse in Microsurgery | 626 |
| Menciassi, Arianna and Eisinberg, Anna and Scalari, Giacomo and Anticoli, Claud | 020 |
| 3D Nanorobotic Manipulations of Multi-walled Carbon Nanotubes | 632 |
| Dong, Lixin and Arai, Fumihito and Fukuda, Toshio | |
| SESSION; WP05 Real-Time Sensing and Supervisory Control of Robotic | Operations |
| Observations Concerning Internet-based Teleoperations for Hazardous Environments | 638 |
| Internet-based Teleoperation | |
| Tarn, Tzyh-Jong and Brady, Kevin | 644 |
| Language Model Approach to Nonblocking Supervisor Synthesis for Nondeterministic Discrete Event Sy Park, Scong-Jin and Lim, Jong-Tac | stems 650 |
| A Bone-reaming System Using Micro Sensors For Internet Force-feedback Control | |
| Modeling and Control of Internet Perced Connective Telephoretics | |
| Modeling and Control of Internet Based Cooperative Teleoperation | |
| | |
| Supervisory Control for Systems of Vehicles in Path Networks | 668 |
| SESSION: WP06 Collision Avoidance and Sensor Based Control | |
| Sensor Based Online Path Planning for Serpentine Robots Gevher, Mustafa and Erkmen, Aydan M. and Erkmen, Ismet | 674 |
| Reactive Behaviours of Mobile Manipulators Based on the DVZ Approach | 680 |
| The System Development of Unmanned Vehicle for the Tele-operated System Interfaced with Driving Si Shim, Jac-Heung and Kim, Min-Scok and Park, Young-Hoon and Kim, Jung-Ha | mulafor 686 |
| Motion Planning for Humanoid Robots Under Obstacle and Dynamic Balance Constraints | 692 |

| Exact Cellular Decomposition of Closed Orientable Surfaces Embedded in R ³ | 699 |
|---|-----|
| Obstacle Detection Using Adaptive Color Segmentation and Color Stereo Homography | 705 |
| SESSION: WP07 Collision Avoidance and Sensor Based Control | |
| Visual Servoing Based on Multirate Sampling Control-application of Perfect Disturbance Rejection Control Pujimoto, Hiroshi and Hori, Yotchi | 711 |
| Stacking Jacobians Properly in Stereo Visual Servoing | 717 |
| Visual Servoing: Path Interpolation by Homography Decomposition | 723 |
| Design and Tracking of Desirable Trajectories in the Image Space by Integrating Mechanical and Visibility Constraints | 731 |
| A Visual Servoing Algorithm Based on Epipolar Geometry Chesi, Graziano and Prattichizzo, Domenico and Vicino, Antonio | 737 |
| A Solution to the Adaptive Visual Servoing Problem | 743 |
| SESSION: WP08 Mobile Robot Design & Application | |
| An Industrial Application of Behavior-oriented Robotics | 749 |
| Automated Container-handling System for Container Production Nurseries Schempf, Hagen and Graham, Todd and Fuchs, Robert and Gasior, Chris | 755 |
| Actively Steerable Inpipe Inspection Robots for Underground Urban Gas pipelines | 761 |
| Design of Continuous Alternate Wheels for Omnidirectional Mobile Robots | 767 |
| Holonomic Omni-directional Vehicle with New Omni-wheel Mechanism Damoto, Riichiro and Cheng, Wendy and Hirose, Shigeo | 773 |
| Dynamic Simulation of Actively-coordinated Wheeled Vehicle Systems on Uneven Terrain | 779 |
| SESSION: WP09 Fig. 5. Flexible Automation (II) | |
| A Methodology for Software Development Cost Analysis in Information-based Manufacturing | |
| Optimal Fixture Layout Design in a Discrete Domain for 3D Workpieces | 792 |

| | Holonic Robot System: A Flexible Assembly System with High Reconfigurability | 799 |
|---------|--|--------------|
| ٠ | New Architecture for Corporate Integration of Simulation and Production Control in Industrial Apple Freund, Eckhard and Hypki, Alfred and Pensky, Dirk H. | ications 806 |
| | Vision-based Automatic Forming of Rheological Objects Using Deformation Transition Graphs Tokumoto, Shinichi and Saito, Takuya and Hirai, Shinichi | 812 |
| | Off-line Error Prediction, Diagnosis and Recovery Using Virtual Assembly Systems | 818 |
| Š | ESSION: WP10 - Design and Planning for Production Systems | 72. |
| | Network Distributed Virtual Design Using Coevolutionary Agents | 824 |
| | Multi-component Genetic Algorithm for Generating Best Bending Sequence and Tool Selection in Sheet Metal Parts Thanapandi, Chitra Malini and Walairacht, Aranya and Ohara, Shigeyuki | |
| | A Hybrid Software Agent Model for Decentralized Control | 836. |
| | A Time Window Based Approach for Job Shop Scheduling | 842 |
| | FMS Scheduling Based on Timed Petri Net Model and RTA* Algorithm | 848 |
| | Optimal Configuration and Partner Selection in Dynamic Manufacturing Networks | 854 |
| | SESSION: WP11 | |
| i de la | Development of a Scaled Teleoperation System for Nano Scale Interaction and Manipulation | 860 |
| | Haptic Display Device with Fingertip Presser for Motion/Force Teaching to Human | 868 |
| | A Framework for Haptic Rendering System Using 6-DOF Force-Feedback Device | 874 |
| | A New Haptic Interface Device Capable of Continuous-time Impedance Display within Sampling-period: Application to Hard Surface Display Kawai, Masayuki and Yoshikawa, Tsunco | 880 |
| | Design Of A New 6-DOF Parallel Haptic Device Lec, J.H. and Eom, K.S. and Yi, B-J. and Suh, I.H. | 886 |
| | Wearable Master Device Using Optical Fiber Curvature Sensors for the Disabled Lee, Kyoobin and Kwon, Dong-Soo | 892 |

| SESSION: WP12 Underwater Robotic Vehicle Control | |
|--|-----|
| Maneuverability of a Flat-streamlined Underwater Vehicle | |
| Closed Loop Time Invariant Control of 3D Underactuated Underwater Vehicles Aicardi, Michele and Casalino, Giuseppe and Indiveri, Giovanni | 903 |
| Interoperability and Synchronisation of Distributed Hardware-in-the-loop Simulation for Underwater Robot Development: Issues and Experiments Lanc, David M. and Falconer, Gavin J. and Randall, Geoph and Edwards, Ian | 909 |
| Planar Motion Steering of Underwater Vehicles by Exploiting Drag Coefficient Modulation | 915 |
| Underwater Cable Following by Twin-Burger 2 | 920 |
| A Virtual Collaborative World Simulator for Underwater Robots Using Multi-dimensional, Synthetic Environment Choi, Song K. and Yuh, Junku | 926 |
| SESSION: WP13 Applications of Robotics Techniques to Computational Biology and Chemistry | |
| Capturing Molecular Energy Landscapes with Probabilistic Conformational Roadmaps Apaydin, Mchmet Serkan and Singh, Amit P. and Brutlag, Douglas L. and Latombe, Jean-Claude | 932 |
| Physical Geometric Algorithms for Structural Molecular Biology | 940 |
| A Motion Planning Approach to Folding: From Paper Craft to Protein Folding | 948 |
| Ligand Binding with OBPRM and User Input | 954 |
| Molecular Docking: A Problem With Thousands of Degrees of Freedom | 960 |
| Programmable Assembly at the Molecular Scale: Self-assembly of DNA Lattices (Invited Paper) | 966 |
| SESSION: WE01 Motion Planning and Learning | |
| A Simple Algorithm for Determining of Movement Duration in Task Space without Violating Joint Angle Constraints Jin, Young G. and Choi, Jin Y. | 972 |
| Design of Jerk Bounded Trajectories for On-line Industrial Robot Applications | 979 |
| Control of Uncertain Flexible Joint Manipulator Using Adaptive Takagi-Sugeno Fuzzy Model Based Controller Park, Chang-Woo and Hyun, Chang-Ho and Park, Min-Sick and Lee, Chang-Hun | 985 |