

# ROSE 2007 - International Workshop on Robotic and Sensors Environments

## Proceedings



**12–13 October 2007  
Ottawa, Ontario, Canada**

*Organized by the IEEE Instrumentation and Measurement Society, the TC-7 Signals and Systems in Measurement of the IEEE I&M Society, the TC-15 Virtual Systems of the IEEE I&M Society, the TC-20 Transportation Systems of the IEEE I&M Society, the TC-27 Human-Computer Interfaces and Interaction of the IEEE I&M Society, and the TC-28 Instrumentation for Robotics & Automation of the I&M Society*

IEEE Catalog Number: 07EX1991  
ISBN: 1-4244-1527-6  
Library of Congress: 2007904850

For technical support:  
Chris Dyer  
Conference Catalysts, LLC  
Phone: +1 785 783 5520  
[cdyer@conferencecatalysts.com](mailto:cdyer@conferencecatalysts.com)

## IEEE ROSE 2007 PROCEEDINGS

© 2007 IEEE. Personal use of this material is permitted. However, permission to reprint/republish this material for advertising or promotional purposes or for creating new collective works for resale or redistribution to servers or lists, or to reuse any copyrighted component of this work in other works must be obtained from the IEEE.

Additional copies may be ordered from:

IEEE Service Center  
445 Hoes Lane  
Piscataway, NJ 08855-1331 USA

+1 800 678 IEEE (+1 800 678 4333)  
+1 732 981 1393  
+1 732 981 9667 (FAX)  
email: [customer-service@ieee.org](mailto:customer-service@ieee.org)

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 that the per-copy fee indicated in the code is paid through the Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923. Other copy, reprint, or reproduction requests should be addressed to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, P.O. Box 1331, Piscataway, NJ 08855-1331. All rights reserved. Copyright © 2006 by the Institute of Electrical and Electronics Engineers, Inc.

IEEE Catalog Number: 07EX1991  
ISBN: 1-4244-1527-6  
Library of Congress: 2007904850

# TABLE OF CONTENTS

<b>WELCOME MESSAGE</b> .....	vi
<b>ROSE 2007 – CONFERENCE COMMITTEE</b> .....	vii
<b>TECHNICAL SESSIONS</b> .....	1

## **Session 1: Robot Vision and Sensing**

<i>An Automated Camera Orientation Recovery Algorithm for an Eye-in-hand Robotic Manipulator</i> .....	1
Sebastian van Delden, University of South Carolina Upstate, USA	
Ricky Farr, University of South Carolina Upstate, USA	
Seth Hensley, University of South Carolina Upstate, USA	

<i>An Enhanced Vision Processing Algorithm for a Micro-manipulation System</i> .....	7
Y. Seok Ihn, Sung Kyun Kwan University, KOREA	
S. H. Ryu, Sung Kyun Kwan University, KOREA	
B. J. Choi, Sung Kyun Kwan University, KOREA	
S. H. Ha, Sung Kyun Kwan University, KOREA	
H. R. Choi, Sung Kyun Kwan University, KOREA	
S. M. Lee, Sung Kyun Kwan University, KOREA	
J. C. Koo, Sung Kyun Kwan University, KOREA	

<i>Vision-Based Exploration Algorithms for Rough Terrain Modeling Using Triangular Mesh Maps</i> .....	13
L. Liu, University of Saskatchewan, CANADA	
T. G. Crowe, University of Saskatchewan, CANADA	
M. Roberge, University of Saskatchewan, CANADA	
J. N. Bakambu, MDA at Brampton, CANADA	

<i>Real-Time Rotationally Invariant Features for Environmental Feature Detection by Mobile Robots and Sensor Networks</i> .....	19
Andre Barczak, Massey University, NEW ZEALAND	
Chris Messom, Massey University, NEW ZEALAND	
Ravi Chemudugunta, Massey University, NEW ZEALAND	

<i>Integrated Sensor System for Humidity Sensing of Robots Using Analog Mixed CMOS Technology</i> .....	25
Sung P. Lee, Kyungnam University, KOREA	
Ji G. Lee, Kyungnam University, KOREA	
Joong W. Chang, Kyungnam University, KOREA	
Joo N. Kim, Kyungnam University, KOREA	
Sang H. Lee, Kyungnam University, KOREA	
Shaestagir Chowdhury, Intel Corporation, USA	

<i>Lossless Compression Techniques in Wireless Sensor Networks: Monitoring Microacoustic Emissions</i> .....	29
Cesare Alippi, Politecnico di Milano, ITALY	
Romolo Camplani, Politecnico di Milano, ITALY	
Cristian Galperti, Politecnico di Milano, ITALY	

## Session 2: Grasping and Manipulation

*A Wheel-Claw Hybrid Manipulator and its Grasping Stability for Mobile Robot Rolling/Crawling Along Flexible Cable* .....34

Gongping Wu, Wuhan University, CHINA  
Xiaohui Xiao, Wuhan University, CHINA  
Yuanbiao Lai, Wuhan University, CHINA

*Robotic Interaction with Deformable Objects under Vision and Tactile Guidance - a Review* .....40

Fouad Khalil, University of Ottawa, CANADA  
Pierre Payeur, University of Ottawa, CANADA

## Session 3: Robot Control

*Time-Delay Compensation and Disturbance Rejection in the Control of Robots with Visco-elastic Joints Using Loop-Shaping Approach*.....46

Meysam Torabi, Sharif University, IRAN  
Mahdieh Taher, Amirkabir University of Technology, IRAN  
Reza Dehestani Ardekani, Sharif University, IRAN  
Mehran Jahed , Sharif University, IRAN

*Artificial Neural Network Control of a Flexible-Joint Manipulator under Unstructured Dynamic Uncertainties* 51

Hicham Chaoui, University of Ottawa, CANADA  
Wail Gueaieb, University of Ottawa, CANADA  
Mustapha Yagoub, University of Ottawa, CANADA

*Design, Control and Implementation of 2-DOF Motion Tracking Platform using Drive-Anti Drive Mechanism for Compensation of Backlash*.....57

Zeeshan Haider, National University of Sciences and Technology, PAKISTAN  
Fahad Habib, National University of Sciences and Technology, PAKISTAN  
Muhammad Haroon Mukhtar, National University of Sciences and Technology, PAKISTAN  
Khalid Munawar, National University of Sciences and Technology, PAKISTAN

*Hexapod Robot Locomotion Using a Fuzzy Controller* .....63

Ziad Sakr, University of Trinidad and Tobago, TRINIDAD & TOBAGO  
Emil Petriu, University of Ottawa, CANADA

*Sensors and Robotic Environment for Care of the Elderly*.....68

Subhas Mukhopadhyay, Massey University, NEW ZEALAND  
Gourab Sen Gupta, Singapore Polytechnic, SINGAPORE

## Session 4: Distributed Sensor Networks and Collaborative Environments

*A Hierarchical LLC Routing Algorithm for WSNs* .....74

Cesare Alippi, Politecnico di Milano, ITALY  
Romolo Camplani, Politecnico di Milano, ITALY  
Manuel Roveri, Politecnico di Milano, ITALY

*eBML: A Formal Language for Behavior Modeling and Application Development in Robotic Collectives*.....80

Razvan Cioarga, Polytechnica University of Timisoara, ROMANIA  
Mihai Micea, Politehnica University of Timisoara, ROMANIA  
Bogdan Ciubotaru, Politehnica University of Timisoara, ROMANIA  
Dan Chiciudean, Politehnica University of Timisoara, ROMANIA  
Vladimir Cretu, Politehnica University of Timisoara, ROMANIA  
Voicu Groza, University of Ottawa, CANADA

## Session 5: Mobile Robotics

*Adaptive Teleoperation of a Mobile Robot under Communication Time Delay*.....86  
Fumitoshi Ogaki, University of Tsukuba, JAPAN  
Kenji Suzuki, University of Tsukuba, JAPAN

*Implementation of Sensors and Control Paradigm for a Hybrid Mobile Robot Manipulator for Search and Rescue Operations* .....92  
Pinhas Ben-Tzvi, University of Toronto, CANADA  
Andrew A. Goldenberg, University of Toronto, CANADA  
Jean W. Zu, University of Toronto, CANADA

*Intelligent Parallel Parking of a Car-like Mobile Robot Using RFID Technology*.....98  
Md. Suruz Miah, University of Ottawa, CANADA  
Wail Gueaieb, University of Ottawa, CANADA

*Autonomous Stair Climbing with Reconfigurable Tracked Mobile Robot*..... 104  
Pinhas Ben-Tzvi, University of Toronto, CANADA  
Shingo Ito, University of Toronto, CANADA  
Andrew A. Goldenberg, University of Toronto, CANADA

## Session 6: Vision-Based Sensing and Image Processing

*Study on Image Definition Function Based on Power-Spectra Analysis*..... 110  
Chen Guojin, Hangzhou Dianzi University, CHINA  
Zhu Miaofen, Hangzhou Dianzi University, CHINA  
Zhang Kesong, Hangzhou Dianzi University, CHINA

*Adaptive Laser Range Scanning*..... 114  
D. MacKinnon, Carleton University, CANADA  
V. Aitken, Carleton University, CANADA  
F. Blais, National Research Council, CANADA  
M. Picard, National Research Council, CANADA

*Fusion of Multispectral Video Sequences Based on the Trajectories of Moving Objects*..... 120  
François Morin, École Polytechnique de Montréal, CANADA  
Guillaume-Alexandre Bilodeau, École Polytechnique de Montréal, CANADA

*Flexible Multi-Camera Network Calibration for Human Gesture Monitoring* ..... 125  
Sylvain Bériault, University of Ottawa, CANADA  
Pierre Payeur, University of Ottawa, CANADA  
Gilles Comeau, University of Ottawa, CANADA

*Steganography in YUV Color Space* ..... 131  
Daniela Stanescu, Polytechnica University of Timisoara, ROMANIA  
Mircea Stratulat, Polytechnica University of Timisoara, ROMANIA  
Voicu Groza, Polytechnica University of Timisoara, ROMANIA  
Ioana Ghergulescu, Polytechnica University of Timisoara, ROMANIA  
Daniel Borca, Polytechnica University of Timisoara, ROMANIA

## WELCOME MESSAGE

The organizing committee welcomes all participants to the 2007 IEEE International Workshop on Robotic and Sensor Environments, held in Ottawa, Canada, on October 12-13, 2007. The two-day program provides an opportunity for researchers interested in various applications of sensing and robotics to discuss their latest results and exchange ideas on the new trends. The main objective of the workshop is to encourage discussion on a broad range of topics and to stimulate new collaborations among the participants.

ROSE 2007 is the fifth edition of this international workshop since its introduction in 2003. Continuing the tradition established by the previous workshops, ROSE addresses recent developments, results and practical experiences in intelligent robotic and control systems from the particular point of view of sensing in the context of the IEEE Instrumentation and Measurement Society.

This year, contributions submitted to the workshop originate from 15 different countries in North America, Asia/Pacific, Europe, Middle East, and Latin America. 24 manuscripts presenting contributions of high quality have been selected for publication. They illustrate the diversity of problems and applications that combine sensors, decision systems and robots. The workshop is especially dedicated to the amalgamation of complementary technologies that provide a strategic advantage for the development of fully autonomous systems. Various types of sensors and sensor systems are discussed and the complementarity of sensing modalities, data fusion and the integration of distributed sensors are also examined. On the other hand, some papers address the development of innovative robotic platforms, their navigation and control techniques.

Three distinguished researchers in the field, Prof. Toshio Fukuda, Prof. Cesare Alippi, and Prof. Subhas Mukhopadhyay, kindly accepted the invitation to address the audience as keynote and invited speakers. Their presentations will contribute to a great conference. The workshop also features an exhibit session where original technologies developed both for commercial and educational purposes will be demonstrated. Participants are encouraged to take advantage of this exciting component of the conference to learn about these new platforms while interacting with researchers coming from complementary backgrounds.

We believe that the contributions to be presented are very valuable to the field of instrumentation and measurement technologies and to their integration in intelligent robotic systems. We wish all participants a fruitful experience at ROSE 2007 workshop.

Welcome to ROSE 2007 and thank for your participation!

### ***General Co-Chairs***

Prof. Pierre Payeur - University of Ottawa, CANADA

Prof. Subhas Mukhopadhyay - Massey University, NEW ZEALAND

### ***Technical Program Co-Chairs***

Prof. Wail Gueaieb - University of Ottawa, CANADA

Prof. Gourab Sen Gupta – Singapore Polytechnic, SINGAPORE

# **ROSE 2007 – CONFERENCE COMMITTEE**

## **Honorary Chair**

Prof. Toshio Fukuda  
Nagoya University, Japan

## **General Co-Chairs**

Dr. Pierre Payeur  
University of Ottawa, CANADA

Dr. Subhas Mukhopadhyay  
Massey University, NEW ZEALAND

## **Technical Program Co-Chairs**

Dr. Wail Gueaieb  
University of Ottawa, CANADA

Dr. Gourab Sen Gupta  
Singapore Polytechnic, SINGAPORE

## **Local Arrangements Co-Chairs**

Phillip Curtis  
University of Ottawa, CANADA

Fouad Khalil  
University of Ottawa, CANADA

## **Workshop Coordinator**

Chris Dyer  
Conference Catalysts, LLC, USA

## **Finance Chair**

Janet Liddiard  
IEEE Instrumentation and Measurement Society, USA

## **Steering Committee**

Dr. Mel Siegel  
Carnegie Mellon University, USA

Dr. Emil M. Petriu  
University of Ottawa, CANADA

Dr. Abdulmotaleb El-Saddik  
University of Ottawa, CANADA