

**The 1999 IEEE International Symposium
on Computational Intelligence
in Robotics and Automation
(CIRA'99)**

Final Program

DoubleTree Hotel
2 Portola Plaza
Monterey, California 93940
U.S.A.

November 8-9, 1999

Sponsored by
the IEEE Robotics and Automation Society

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Joe Weiss, EPRI
Juyang Weng, Michigan State University
Yoshio Yamamoto, Tokai University
Feng Zhao, Xerox Palo Alto Research Center

**The 1999 IEEE International Symposium on Computational Intelligence
in Robotics and Automation (CIRA '99) Session Schedule**

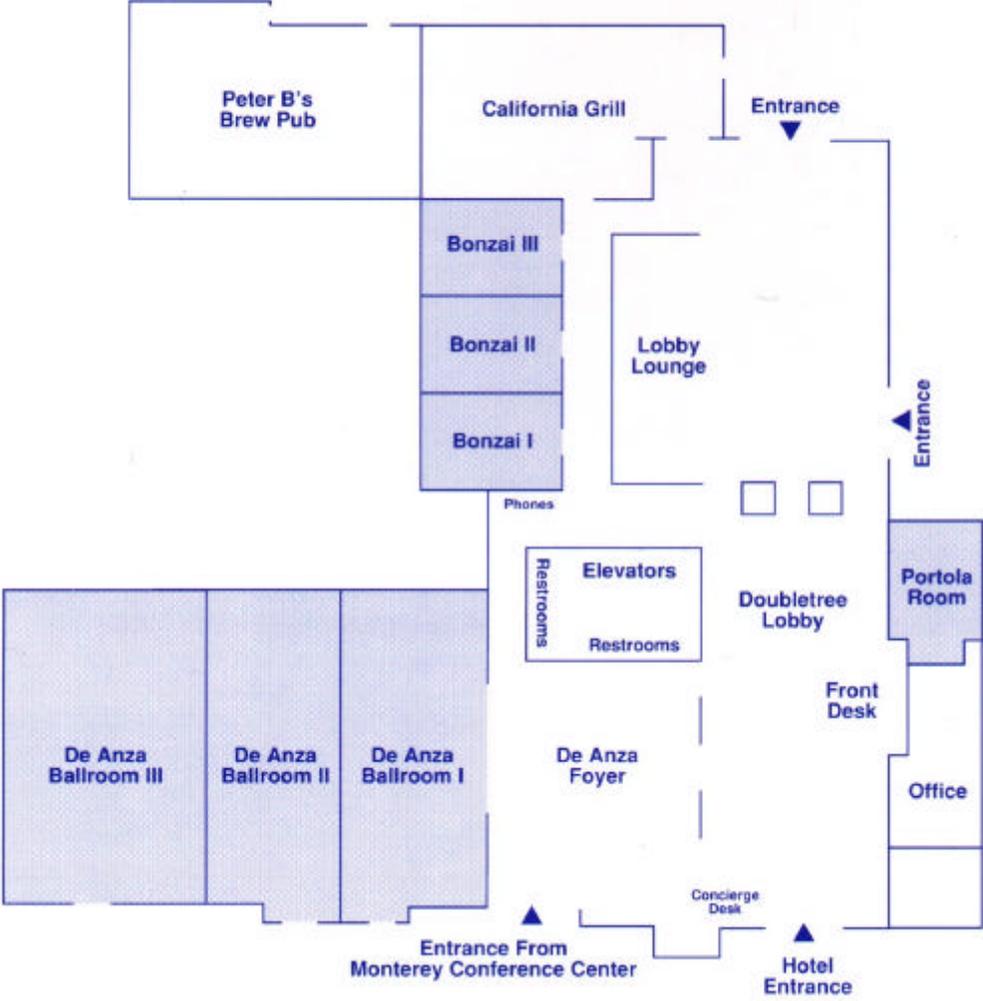
Monday, November 8, 1999

Room	Bonzai I	Bonzai II
8:00-8:10	Welcome and Opening Remarks (Bonzai I and II)	
8:10-8:50	Plenary Talk: Dr. Doug Gage, If Our Robots are so Smart, Why aren't We All Rich?	
9:00-10:15	MA 1-1: Grasping	MA 1-2: Programming and Design
10:45-12:00	MA 2-1: Manipulation I	MA 2-2: Motion Control
12:00-1:30	Lunch	
1:30-2:45	MP 1-1: Nonholonomic Control	MP 1-2: Arbitration and Behavior Coordination
3:10-4:25	MP 2-1: Manufacturing	MP 2-2: Planning
4:50-6:05	MP 3-1: Multi-Legged Robots	MP 3-2: Multi-Agent Systems
6:30-10:00	Symposium Banquet (Bonzai III) --- Keynote Address: Professor David Miller, On the Automated Generation of Robot Designers	

Tuesday, November 9, 1999

Room	Bonzai I	Bonzai II
8:00-8:50	Plenary Talk: Professor Thomas A. Henzinger, A Symbolic Approach to Hybrid Dynamical Systems (Bonzai I and II)	
9:00-10:15	TA 1-1: Position Estimation	TA 1-2: Robots and Living Things (HCI)
10:45-12:00	TA 2-1: Path Planning	TA 2-2: Object Recognition
12:00-1:30	Lunch	
1:30-3:10	TP 1-1: Localization	TP 1-2: Active Vision and Attention Control
3:35-5:15	TP 2-1: Exploration and Mapping	TP 2-2: Manipulation II

LEVEL ONE



DoubleTree Hotel Ground Level Floor Plan

Monday, November 8, 1999

8:00 – 8:10 Opening and Welcome Remarks
Room: Bonzai I and Bonzai II

8:10 – 8:50 Plenary Talk
Room: Bonzai I and Bonzai II

Chair:
Alan C. Schultz
Naval Research Laboratory

Speaker:
Dr. Doug Gage
Space and Naval Warfare Systems Center, San Diego

If Our Robots are so Smart, why aren't We All Rich? (The Challenges of Implementing Autonomous Robots)

Abstract: One of the joys of working in robotics is that it is a wonderfully interdisciplinary field. This means that the successful development of a capable autonomous robotic system requires the integration of many diverse elements, including mechatronics, sensors, processing, and power. Therefore, it is not enough for an element of computational intelligence to be totally successful in its own terms; if it is to contribute to the functionality and performance of the robotic system as a whole, then it must also be appropriately integrated with the system's other components. This talk explores some of the challenges of robotic system integration, including a number of lessons learned in a variety of projects over the past decade and a half.

8:50 – 9:00 Break

Session MA1-1: **GRASPING**

Room: Bonzai I

Chairs:

Pedro J. Sanz, Jaume-I University

Ayana M. Howard, University of South California

1. 9:00 – 9:25

Towards a Reactive Grasping System for an Industrial Robot Arm

Pedro J. Sanz, Gabriel Recatala, V. Javier Traver, and P. del Pobil, Jaume-I University, Spain

2. 9:25 – 9:50

Learning to Grasp by Using Visual Information

Alfredo Anglani, Francesco Taurisano, Roberto De Giuseppe, and Cosimo Distante, Universita di Lecce, Italy

3. 9:50 – 10:15

Intelligent Learning for Deformable Object Manipulation

Ayana M. Howard and George A. Bekey, University of South California, U.S.A.

Session MA1-2: **PROGRAMMING AND DESIGN**

Room: Bonzai II

Chairs:

Ian Douglas Horswill, Northwestern University

Xiaobu Yuan, Memorial University of Newfoundland

1. 9:00 – 9:25

A Fuzzy Approach to Hand Functioning in Virtual Programming

Xiaobu Yuan, Memorial University of Newfoundland, Canada, and Hanqiu Sun, The Chinese University of Hong Kong, Kong Kong

2. 9:25 – 9:50

Functional Programming of Behavior-Based Systems

Ian Douglas Horswill, Northwestern University, U.S.A.

3. 9:50 – 10:15

Soft Computing-based Design and Control for Mobile Robot Path Tracking

Abdollah Homaifar, North Carolina A&T State University, U.S.A., Daryl Battle, Lucent Technologies, U.S.A., and Edward Tunstel, Jet Propulsion Laboratory, U.S.A.

10:15 - 10:45 Break

Session MA2-1: **MANIPULATION I**

Room: Bonzai I

Chairs:

Won-Jee Chung, Chang-Won National University

Simon X. Yang, University of Guelph

1. 10:45 – 11:10

A Method for On-line Trajectory Planning of Robot Manipulators in Cartesian Space

Xiang-Rong Xu, Won-Jee Chung, and Young-Hyu Choi, Chang-Won National University, Korea

2. 11:10 – 11:35

Real-time Collision-free Path Planning of Robot Manipulators Using Neural Network Approaches

Simon X. Yang, University of Guelph, Canada, and Max Meng, University of Alberta, Canada

3. 11:35 – 12:00

An Adaptive Fuzzy Approach for Robot Manipulators Tracking

Eddie Kwan and Ming Liu, Monash University, Clayton Campus, Australia

Session MA2-2: **MOTION CONTROL**

Room: Bonzai II

Chairs:

George Chronis, University of Missouri-Columbia

Karl L. Paap, GMD-AiS, Germany

1. 10:45 – 11:10

Motion Control Scheme for a Snake-Like Robot

Karl L. Paap, Frank Kirchner, and Bernhard Klaassen, GMD-AiS, Germany

2. 11:10 – 11:35

Adaptive Control of an Autonomous Underwater Vehicle: Experimental Results on ODIN

Gianluca Antonelli, Universita degli Studi di Napoli Federico II, Italy, Stefano Chiaverini, Universita degli Studi di Cassino, Italy, Nilanjan Sarkar, and Michael West, University of Hawaii at Manoa, U.S.A.

3. 11:35 – 12:00

Learning Fuzzy Rules by Evolution for Mobile Agent Control

George Chronis, James Keller, and Marjorie Skubic, University of Missouri-Columbia, U.S.A.

12:00 - 1:30 LUNCH

Session MP1-1: **NONHOLONOMIC CONTROL**

Room: Bonzai I

Chairs:

Wei Kang, Naval Postgraduate School

Younguk Yim, Pohang University of Science and Technology

1. 1:30 – 1:55

Tracking Control of Nonholonomic Mobile Robots

Jindong Tan, Ning Xi, Michigan State University, U.S.A., and Wei Kang, Naval Postgraduate School, U.S.A.

2. 1:55 – 2:20

Modeling of Vehicle Dynamics from Real Vehicle Measurements Using a Neural Network with Two-stage Learning for High Precision

Se-Young Oh and Younguk Yim, Pohang University of Science and Technology, Korea

3. 2:20 – 2:45

A Fuzzy Logic Controller for Car-like Mobile Robots

Jacky Baltes and Robin Otte, University of Auckland, New Zealand

Session MP1-2: **ARBITRATION AND BEHAVIOR COORDINATION**

Room: Bonzai II

Chairs:

Julio K. Rosenblatt, University of Sydney

Maja Mataric, University of South California

1. 1:30 – 1:55

Optimal Selection of Uncertain Actions by Maximizing Expected Utility

Julio K. Rosenblatt, University of Sydney, Australia

2. 1:55 – 2:20

A Decision-Theoretic Approach to Fuzzy Behavior Coordination

Paolo Pirjanian and Maja Mataric, University of South California, U.S.A.

3. 2:20 – 2:45

A Fuzzy Control for Cooperative Tentacle Robot System

Mircea Ivanescu and Nicu Bizdoaca, University of Craiova, Romania

2:45 - 3:10 Break

Session MP2-1: **MANUFACTURING**

Room: Bonzai I

Chairs:

A. Ramirez, University of Toronto

Swee Mok, Motorola Inc.

1. 3:10 – 3:35

A New Correspondenceless Geometric Algorithm for Motion Estimation from Range Images

Yonghuai Liu and Marcos A. Rodrigues, The University of Hull, U.K.

2. 3:35 – 4:00

Moore Automata for Flexible Routing and Flow Control in Manufacturing Workcells

A. Ramirez, S.C. Zhu, and B. Benhabib, University of Toronto, Canada

3. 4:00 – 4:25

A Hierarchical Workcell Model for Intelligent Assembly and Disassembly

Swee Mok, Motorola Inc., U.S.A., Chi-haur Wu, Northwestern University, U.S.A., and D.T. Lee, Academia Sinica, Taiwan

Session MP2-2: **PLANNING**

Room: Bonzai II

Chairs:

Peter Allen, Columbia University

Colleen McCarthy, University of Pittsburgh

1. 3:10 – 3:35

Constraint-Based Sensor Planning for Scene Modeling

Michael Reed and Peter Allen, Columbia University, U.S.A.

2. 3:35 – 4:00

Learning Discrete Bayesian Models for Autonomous Agent Navigation

Daniel Nikovski and Illah Nourbakhsh, Carnegie Mellon University, U.S.A.

3. 4:00 – 4:25

Towards Focused Plan Monitoring: A Technique and an Application to Mobile Robots

Martha E. Pollack and Colleen McCarthy, University of Pittsburgh, U.S.A.

04:25 - 04:50 Break

Session MP3-1: **MULTI-LEGGED ROBOTS**

Room: Bonzai I

Chairs:

Joe Cronin, University of New South Wales

Gary B. Parker, Connecticut College

1. 4:50 – 5:15

Walking Biped Robot with Distributed Hierarchical Control System

Joe Cronin, Richard Frost, and Richard Willgoss, University of New South Wales, Australia

2. 5:15 – 5:40

The Body Impedance Control for Walking Stabilization of a Quadrupedal Robot

Soo-Yeong Yi, Chonbuk National University, Korea, Yeh-Sun Hong, and Chong-Won Lee, Korea Institute of Science and Technology, Korea

3. 5:40 – 6:05

The Co-Evolution of Model Parameters and Control Programs in Evolutionary Robotics

Gary B. Parker, Connecticut College, U.S.A.

Session MP3-2: **MULTI-AGENT SYSTEMS**

Room: Bonzai II

Chairs:

Michael Bowling, Carnegie Mellon University

Tao Wei Min, DSO National Laboratories, Singapore

1. 4:50 – 5:15

Motion Control in Dynamic Multi-Robot Environments

Michael Bowling and Manuela Veloso, Carnegie Mellon University, U.S.A.

2. 5:15 – 5:40

Evolving Control for Distributed Micro Air Vehicles

Annie S. Wu, Alan C. Schultz, Naval Research Laboratory, U.S.A., and Arvin Agah, The University of Kansas, U.S.A.

3. 5:40 – 6:05

A Rules and Communication Based Multiple Robots Transportation System

Tao Wei Min, Li Zhe, How Khee Yin, Goh Cher Hiang, and Lou Kok Yong, DSO National Laboratories, Singapore

6:30 – 10:00 **Symposium Banquet**

Room: Bonzai III

Keynote Address Speaker:

Professor David Miller

University of Oklahoma

Technical Director

KISS Institute for Practical Robotics

On the Automated Generation of Robot Designers

Abstract: Most roboticists got their start by disassembling their toys and writing assembly code on their high school computer. Mechanical toys are now a rarity and low-level access to a modern PC is difficult, to say the least. Where will future roboticists come from? This talk will discuss these issues and present some programs that are not only training future roboticists, but are using robots to revive general science and math education.

Tuesday, November 9, 1999

8:00 – 8:50 Plenary Talk
 Room: Bonzai I and Bonzai II

Chair:
Alan C. Schultz
Naval Research Laboratory

Speaker:
Thomas A. Henzinger
University of California, Berkeley

A Symbolic Approach to Hybrid Dynamical Systems

Abstract: A hybrid system is a dynamical system whose state has both a discrete component, which is updated in a sequence of steps, and a continuous component, which evolves over time. Hybrid systems are a useful modeling tool in a variety of situations, including the embedded (digital) control of physical (analog) plants, robotics, and finance.

We survey a computational approach to the analysis of hybrid systems which is based on the symbolic discretization of continuous state changes. In particular, we classify infinite, hybrid state spaces as to which finite, discrete abstractions they admit. This classification enables us to apply concepts and results from concurrency theory, model checking, and discrete-event control to hybrid systems

8:50 – 9:00 Break

Session TA1-1: **POSITION ESTIMATION**

Room: Bonzai I

Chairs:

E.R. Bachmann, Naval Postgraduate School

Jeff Hyams, University of South Florida

1. 9:00 – 9:25

Orientation Tracking for Humans and Robots Using Inertial Sensors

E.R. Bachmann, I. Duman, U.Y. Usta, R.B. McGhee, X. Yun, and M.J. Zyda, Naval Postgraduate School, U.S.A.

2. 9:25 – 9:50

Cooperative Navigation of Micro-Rovers using Color Segmentation

Jeff Hyams, Mark W. Powell, and Robin Murphy, University of South Florida, U.S.A.

3. 9:50 – 10:15

The Evolved Gaussian Mixture Bayes' Technique using Sensor Selection Task Integrated with Sensor Fusion Scheme in Mobile Robot Position Estimation

Takamasa Koshizen, The Australia National University, Australia

Session TA1-2: **ROBOTS AND LIVING THINGS (HCI)**

Room: Bonzai II

Chairs:

Dennis Perzanowski, Naval Research Laboratory

Marc Bohlen, Carnegie Mellon University

1. 9:00 – 9:25

Goal Tracking in a Natural Language Interface: Towards Achieving Adjustable Autonomy

Dennis Perzanowski, Alan C. Schultz, William Adams, and Elaine Marsh, Naval Research Laboratory, U.S.A.

2. 9:25 – 9:50

A Robot in a Cage: Exploring Interactions between Animals and Robots

Marc Bohlen, Carnegie Mellon University, U.S.A.

3. 9:50 – 10:15

Detection of Aircraft-Pilot-Coupling Caused Oscillations

A.T. Koivo, Purdue University, U.S.A., D.W. Repperger, Air Force Research Lab, U.S.A., and A. J. Koivo, Purdue University, U.S.A.

10:15 - 10:45 Break

Session TA2-1: **PATH PLANNING**

Room: Bonzai I

Chairs:

John S. Zelek, University of Guelph

Maurizio Piaggio, University of Genoa, Italy

1. 10:45 – 11:10

Gradient Method in Function Space for Solving a Minimum Path Problem

E.M. Khazen, University of Maryland, U.S.A.

2. 11:10 – 11:35

Dynamic Issues for Mobile Robot Real-Time Discovery & Path Planning

John S. Zelek, University of Guelph, Canada

3. 11:35 – 12:00

AI-CART: An Algorithm to Incrementally Calculate Artificial Potential Fields in Real-Time

Maurizio Piaggio and Antonio Sgorbissa, University of Genoa, Italy

Session TA2-2: **OBJECT RECOGNITION**

Room: Bonzai II

Chairs:

Steffen Simon, University of Ulm

M. Ihsan Ecemis, Boston University

1. 10:45 – 11:10

Object Classification with Simple Visual Attention and a Hierarchical Neural Network for Subsymbolic-symbolic Coupling

Steffen Simon, Hans A. Kestler, Axel Baune, Friedhelm Schwenker, and Gunther Palm, University of Ulm, Germany

2. 11:10 – 11:35

Object Recognition with Ultrasonic Sensors

M. Ihsan Ecemis and Paolo Gaudiano, Boston University, U.S.A.

3. 11:35 – 12:00

Target Localization and Identification Using CTFM Sonar Imaging: The AURBIT Method

Z. Politis and P.J. Probert, University of Oxford, U.K.

12:00 - 1:30 LUNCH

Session TP1-1: **LOCALIZATION**

Room: Bonzai I

Chairs:

Uwe Gerecke, University of Sheffield

J. Reuter, Institute of Measurement and Automation

1. 1:30 – 1:55

Quick and Dirty Localization for a Lost Robot

Uwe Gerecke and Noel Sharkey, University of Sheffield, U.K.

2. 1:55 – 2:20

Reducing Localization Errors by Scan-Based Multiple Hypotheses Tracking

J. Reuter, Institute of Measurement and Automation, Germany

3. 2:20 – 2:45

Acoustic-Based Room Discrimination for the Navigation of Autonomous Mobile Robots

Guido Tesch and Uwe R. Zimmer, GMD-Japan Research Laboratory, Japan

4. 2:45 – 3:10

Performance Evaluation of Proprioceptive Sensor Sets for Civil-Engineering Articulated Vehicle Localisation

Denis Bouvet and Gaetan Garcia, Institut de Recherche en Cybernetique de Nantes (IRCyN), France

Session TP1-2: **ACTIVE VISION AND ATTENTION CONTROL**

Room: Bonzai II

Chairs:

O.A. Basir, University of Guelph

Luiz M.G. Goncalves, University of Massachusetts

1. 1:30 – 1:55

Towards a Framework for Robot Cognition

Luiz M.G. Goncalves, Davis S. Weeler, University of Massachusetts, U.S.A., Antonio A.F. Oliveira, Federal University of Rio de Janeiro, Brazil, and Roderic A. Grupen, University of Massachusetts, U.S.A.

2. 1:55 – 2:20

Learning Policies for Attentional control

Luiz M.G. Goncalves, University of Massachusetts, U.S.A., Gilson A. Giraldi, Antonio A.F. Oliveira, Federal University of Rio de Janeiro, Brazil, and Roderic A. Grupen, University of Massachusetts, U.S.A.

3. 2:20 – 2:45

A Hybrid Genetic Algorithm for Optimizing Sensing Parameters in 3D Motion Estimation Applications

P. Tsui and O.A. Basir, University of Guelph, Canada

4. 2:45 – 3:10

Next Best View System in a 3-D Object Modeling Task

L.M. Wong, C. Dumont and M.A. Abidi, The University of Tennessee, U.S.A.

3:10 - 3:35 Break

Session TP2-1: **EXPLORATION AND MAPPING**

Room: Bonzai I

Chairs:

Jens-Steffen Gutmann, Institut fur Informatik

Xiaowei Ma, Institute for information Sciences. Inc., U.S.A.

1. 3:35 – 4:00

Exploration of Unknown Environments Using a Compass, Topological Map and Neural Network

Tom Duckett and Ulrich Nehmzow, University of Manchester, U.K.

2. 4:00 – 4:25

Incremental Mapping of Large Cyclic Environments

Jens-Steffen Gutmann, Institut fur Informatik, Germany and Kurt Konolige, SRI International, U.S.A.

3. 4:25 – 4:50

Fuzzy Logic Based Mobile Robot Area Filling with Vision System for Indoor Environments

Yili Fu, Harbin Institute of Technology, China, and Sherman Y.T. Lang, NRC Integrated Manufacturing Technologies Institute, Canada

4. 4:50 – 5:15

Multifunctional Learning of a Multiagent Based Evolutionary Artificial Neural Network with Lifetime Learning

Fang Wang and Eric Mckenzie, The University of Edinburgh, U.K.

Session TP2-2: **MANIPULATION II**

Room: Bonzai II

Chairs:

Kevin Rathbone, University of Sheffield

O. Barambones, Universidad del Pais Vasco

1. 3:35 – 4:00

Task Space Analysis of Multiple Mobile Manipulator System

Yoshio Yamamoto, Tokai University, Japan and Xiaoping Yun, Naval Postgraduate School, U.S.A.

2. 4:00 – 4:25

Evolving Robot Arm Controllers for Continued Adaptation

Kevin Rathbone and Noel Sharkey, University of Sheffield, U.K.

3. 4:25 – 4:50

Autonomous Vision-Based Manipulation from a Rover Platform

Issa A.D. Nesnas, Mark W. Maimone, and Hari Das, Jet Propulsion Laboratory, U.S.A.

4. 4:50 – 5:15

An Adaptive Neural Control Scheme for Mechanical Manipulators with Guaranteed Stability

O. Barambones and V. Etxebarria, Universidad del Pais Vasco, Spain