

Lecture Notes in Artificial Intelligence 5949

Edited by R. Goebel, J. Siekmann, and W. Wahlster

Subseries of Lecture Notes in Computer Science

Jacky Baltes Michail G. Lagoudakis
Tadashi Naruse Saeed Shiry Ghidary (Eds.)

RoboCup 2009: Robot Soccer World Cup XIII

Series Editors

Randy Goebel, University of Alberta, Edmonton, Canada
Jörg Siekmann, University of Saarland, Saarbrücken, Germany
Wolfgang Wahlster, DFKI and University of Saarland, Saarbrücken, Germany

Volume Editors

Jacky Baltes
University of Manitoba, Department of Computer Science
Winnipeg, Manitoba R3T 2N2, Canada
E-mail: jacky@cs.umanitoba.ca

Michail G. Lagoudakis
Technical University of Crete, Intelligent Systems Laboratory
Department of Electronic and Computer Engineering
73100 Chania, Greece
E-mail: lagoudakis@intelligence.tuc.gr

Tadashi Naruse
Aichi Prefectural University, School of Information Science and Technology
Nagakute-cho, Aichi 480-1198, Japan
E-mail: naruse@ist.aichi-pu.ac.jp

Saeed Shiry Ghidary
Amirkabir University of Technology
Computer Engineering and Information Technology Department
Hafez Avenue, Tehran 15914, Iran
E-mail: shiry@ce.aut.ac.ir

The photo for the cover illustration was taken by David Kriesel;
copyright by University of Bonn.

Library of Congress Control Number: 2010920867

CR Subject Classification (1998): I.2, C.2.4, D.2.7, H.5, I.5.4, J.4

LNCS Sublibrary: SL 7 – Artificial Intelligence

ISSN 0302-9743
ISBN-10 3-642-11875-5 Springer Berlin Heidelberg New York
ISBN-13 978-3-642-11875-3 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

springer.com

© Springer-Verlag Berlin Heidelberg 2010
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India
Printed on acid-free paper SPIN: 12842797 06/3180 5 4 3 2 1 0

Preface

We are really pleased to present the proceedings of the RoboCup International Symposium 2009. The 13th RoboCup Symposium was held in conjunction with the RoboCup 2009 competition in Graz, Austria from June 29 to July 5, 2009.

The symposium highlights the many research contributions and achievements of the RoboCup community. Contributions from all leagues (RoboCupSoccer, RoboCupRescue, RoboCup@Home, and RoboCupJunior) are included in the symposium. The papers published in these proceedings are not limited to practical issues, but also include fundamental research, system evaluation, and robotics education topics.

There were 112 submissions from 25 countries. All papers were carefully reviewed by an international Program Committee of 96 members, who were assisted by 25 additional reviewers. Each paper was reviewed by three Program Committee members and all reviews were carefully considered and discussed by the Symposium Co-chairs, who made the final decisions. The review process was extremely selective and many good papers could not be accepted for the final program. Out of the 112 submissions, 22 papers were selected for oral presentations, whereas 17 papers were selected for poster presentations. Two of these papers were recognized for their outstanding quality. Specifically, Mohsen Malmir and Saeed Shiry received the best paper award for their paper titled “Object Recognition with Statistically Independent Features: A Model Inspired by the Primate Visual Cortex” and Shivaram Kalyanakrishnan and Peter Stone received the best student paper award for their paper titled “Learning Complementary Mutliagent Behaviors: A Case Study”.

In addition to the paper and poster presentations, which cover the state of the art in a broad range of topics central to the Robocup community, we were delighted to welcome a number of distinguished invited speakers (Auke Ijspeert of the Ecole Polytechnique Fédérale de Lausanne, Switzerland, Ulises Cortés of the Technical University of Catalonia, Spain, Silvia Coradeschi of Orebro University, Sweden, and Robin Murphy of the Texas A&M University, USA). These talks were complemented by a number of additional talks by leading robotics researchers and representatives of all RoboCup leagues.

We would like to take this opportunity to thank the Program Committee members and the external reviewers for their hard work and, of course, all the authors for their contributions! Furthermore, we would like to thank the authors of the Easychair system, which was used to manage the submission and publication process, for their excellent work.

November 2009

Jacky Baltes
Michail G. Lagoudakis
Tadashi Naruse
Saeed Shiry

Organization

Symposium Chairs

Jacky Baltes	University of Manitoba, Canada
Michail G. Lagoudakis	Technical University of Crete, Greece
Tadashi Naruse	Aichi Prefectural University, Japan
Saeed Shiry	Amirkabir University of Technology, Iran

Program Committee

Carlos Acosta	Singapore Polytechnic, Singapore
H. Levent Akin	Bogaziçi University, Turkey
Luis Almeida	University of Aveiro, Portugal
Francesco Amigoni	Politecnico di Milano, Italy
John Anderson	University of Manitoba, Canada
Sven Behnke	University of Bonn, Germany
Andreas Birk	Jacobs University, Germany
Andrea Bonarini	Politecnico di Milano, Italy
Ansgar Bredenfeld	Fraunhofer IAIS, Germany
Ramon Brena	Tecnologico de Monterrey, Mexico
Hans-Dieter Burkhard	Humboldt University Berlin, Germany
Vincenzo Caglioti	Politecnico di Milano, Italy
Stefano Carpin	University of California, Merced, USA
Riccardo Cassinis	University di Brescia, Italy
Weidong Chen	Shanghai Jiao Tong University, China
Xiaoping Chen	University of Science and Technology of China, China
Silvia Coradeschi	Orebro University, Sweden
Paulo Costa	University of Porto, Portugal
M. Bernardine Dias	Carnegie Mellon University, USA
Amy Eguchi	Bloomfield College, USA
Alessandro Farinelli	University of Southampton, UK
Emanuele Frontoni	Univ Politecnica delle Marche, Italy
Giuseppina Gini	Politecnico di Milano, Italy
Alexander Hofmann	Technikum Wien, Austria
Dennis Hong	Virginia Tech, USA
Harukazu Igarashi	Shibaura Institute of Technology, Japan
Giovanni Indiveri	University of Lecce, Italy
Luca Iocchi	Sapienza University of Rome, Italy
David Jahshan	University of Melbourne, Australia

VIII Organization

Mansour Jamzad	Sharif University of Technology, Iran
Shivaram Kalyanakrishnan	University of Texas, Austin, USA
Kamalakar Karlapalem	International Institute of Information Technology, India
Holger Kenn	European Microsoft Innovation Center, Germany
Testuya Kimura	Nagaoka University of Technology, Japan
Alexander Kleiner	Freiburg University, Germany
Gerhard Kraetzschmar	University of Applied Sciences Bonn-Rhein-Sieg, Germany
Tim Laue	DFKI Bremen, Germany
Paul Levi	University of Stuttgart, Germany
Simon Levy	Washington and Lee University, USA
Pedro Lima	Instituto Superior Técnico, TU Lisbon, Portugal
Yasuhiro Masutani	Osaka Electro-Communication University, Japan
Hitoshi Matsubara	Future University - Hakodate, Japan
Matteo Matteucci	Politecnico di Milano, Italy
Emanuele Menegatti	University of Padova, Italy
Çetin Meriçli	Bogaziçi University, Turkey
Tekin Meriçli	Bogaziçi University, Turkey
Norbert Michael Mayer	National Chung Cheng University, Taiwan
Dorothy Monekosso	Kingston University, UK
Kazuhito Murakami	Aichi Prefectural University, Japan
Yasunori Nagasaka	Chubu University, Japan
Tomoharu Nakashima	Osaka Prefecture University, Japan
Daniele Nardi	Sapienza University of Rome, Italy
Eslam Nazemi	Shahid Beheshti University, Iran
Itsuki Noda	National Institute of Advanced Industrial Science and Technology, Japan
Tairo Nomura	Saitama University, Japan
Majid Nourhosseini	Amirkabir University of Technology, Iran
Oliver Obst	CSIRO ICT Centre, Australia
Takeshi Ohashi	Kyushu Institute of Technology, Japan
Fiora Pirri	Sapienza University of Rome, Italy
Simon Parsons	City University of New York, USA
Daniel Polani	University of Hertfordshire, UK
Michael Quinlan	University of Texas, Austin, USA
Luis Paulo Reis	University of Porto, Portugal
Marcello Restelli	Politecnico di Milano, Italy
Fernando Ribeiro	Minho University, Portugal
Martin Riedmiller	University of Osnabrück, Germany
Raul Rojas	Free University of Berlin, Germany
Javier Ruiz del Solar	Universidad de Chile, Chile
Paul Rybski	Carnegie Melon University, USA
Thomas Röfer	DFKI - Deutsches Forschungszentrum für Künstliche Intelligenz GmbH, Germany

Vitor Santos	University of Aveiro, Portugal
Stefan Schiffer	RWTH Aachen University, Germany
Ali Shahri	Iran University of Science and Technology, Iran
Domenico G. Sorrenti	Università di Milano - Bicocca, Italy
Mohan Sridharan	University of Birmingham, UK
Tomoichi Takahashi	Meijo University, Japan
Yasutake Takahashi	Osaka University, Japan
Ahmed Tawfik	Univ of Windsor, Canada
Tijn van der Zant	University of Groningen, The Netherlands
Sergio Velastin	Kingston University, UK
Igor Verner	Technion - Israel Institute of Technology, Israel
Ubbo Visser	University of Miami, USA
Nikos Vlassis	Technical University of Crete, Greece
Oskar von Stryk	Technische Universität Darmstadt, Germany
Thomas Wagner	Bremen University, Germany
Alfredo Weitzenfeld	Inst Tecnológico Autonomo de Mexico, Mexico
Mary-Anne Williams	University of Technology, Sydney, Australia
Andrew Williams	Spelman College, USA
Martijn Wisse	Delft University of Technology, The Netherlands
Franz Wotawa	Technische Universität Graz, Austria
Guangming Xie	Peking University, China
Andreas Zell	University of Tuebingen, Germany
Mingguo Zhao	Tsinghua University, China
Changjiu Zhou	Singapore Polytechnic, Singapore
Stefan Zickler	Carnegie Mellon University, USA
Vittorio Ziparo	Sapienza University of Rome, Italy

Additional Reviewers

Markus Bader	Balajee Kannan
Oliver Birbach	Fabio Dalla Libera
Domenico Daniele Bloisi	Gil Lopes
João Certo	Hartmut Messerschmidt
Hon Keat Chan	Hugo Picado
Andrea Cherubini	Dietmar Schreiner
Ertan Dogrultan	Armando Sousa
Christian Dornhege	Matteo Taiana
Francesco Maria delle Fave	Stephan Timmer
Thomas Gabel	Jingchuan Wang
Kai Haeussermann	Yong Wang
Roland Hafner	Feng Wu
Zina M. Ibrahim	Marco Zaratti
Giovanni Indiveri	Yue Zhang
E. Gil Jones	

Table of Contents

Coordinated Action in a Heterogeneous Rescue Team	1
<i>Fares Alnajar, Hanne Nijhuis, and Arnoud Visser</i>	
Concept Evaluation of a Reflex Inspired Ball Handling Device for Autonomous Soccer Robots	11
<i>Harald Altinger, Stefan J. Galler, Stephan Mühlbacher-Karrer, Gerald Steinbauer, Franz Wotawa, and Hubert Zangl</i>	
Development of a Realistic Simulator for Robotic Intelligent Wheelchairs in a Hospital Environment	23
<i>Rodrigo A.M. Braga, Pedro Malheiro, and Luis Paulo Reis</i>	
Creating Photo Maps with an Aerial Vehicle in USARsim	35
<i>Heikow Bülow, Andreas Birk, and Shams Feyzabadi</i>	
Real-Time Hand Gesture Recognition for Human Robot Interaction	46
<i>Mauricio Correa, Javier Ruiz-del-Solar, Rodrigo Verschae, Jong Lee-Ferng, and Nelson Castillo</i>	
Combining Key Frame Based Motion Design with Controlled Movement Execution	58
<i>Stefan Czarnetzki, Sören Kerner, and Daniel Klagges</i>	
Applying Dynamic Walking Control for Biped Robots	69
<i>Stefan Czarnetzki, Sören Kerner, and Oliver Urbann</i>	
Modeling Human Decision Making Using Extended Behavior Networks	81
<i>Klaus Dorer</i>	
Motion Synthesis through Randomized Exploration on Submanifolds of Configuration Space	92
<i>Ioannis Havoutis and Subramanian Ramamoorthy</i>	
Robust and Computationally Efficient Navigation in Domestic Environments	104
<i>Dirk Holz, Gerhard K. Kraetzschmar, and Erich Rome</i>	
Robust Collision Avoidance in Unknown Domestic Environments	116
<i>Stefan Jacobs, Alexander Ferrein, Stefan Schiffer, Daniel Beck, and Gerhard Lakemeyer</i>	
Real-Time Ball Tracking in a Semi-automated Foosball Table	128
<i>Rob Janssen, Jeroen de Best, and René van de Molengraft</i>	

Three Humanoid Soccer Platforms: Comparison and Synthesis	140
<i>Shivaram Kalyanakrishnan, Todd Hester, Michael J. Quinlan, Yinon Bentor, and Peter Stone</i>	
[Best Student Paper] Learning Complementary Multiagent Behaviors: A Case Study	153
<i>Shivaram Kalyanakrishnan and Peter Stone</i>	
Rollover as a Gait in Legged Autonomous Robots: A Systems Analysis	166
<i>Vadim Kyrlov, Mihai Catalina, and Henry Ng</i>	
Pareto-Optimal Collaborative Defensive Player Positioning in Simulated Soccer	179
<i>Vadim Kyrlov and Eddie Hou</i>	
A Novel Camera Parameters Auto-adjusting Method Based on Image Entropy	192
<i>Huimin Lu, Hui Zhang, Shaowu Yang, and Zhiqiang Zheng</i>	
[Best Paper] Object Recognition with Statistically Independent Features: A Model Inspired by the Primate Visual Cortex	204
<i>Mohsen Malmir and Saeed Shiry</i>	
Using Genetic Algorithms for Real-Time Object Detection	215
<i>J. Martínez-Gómez, J.A. Gámez, I. García-Varea, and V. Matellán</i>	
An Approximate Computation of the Dominant Region Diagram for the Real-Time Analysis of Group Behaviors	228
<i>Ryota Nakanishi, Junya Maeno, Kazuhito Murakami, and Tadashi Naruse</i>	
A Lua-based Behavior Engine for Controlling the Humanoid Robot Nao	240
<i>Tim Niemüller, Alexander Ferrein, and Gerhard Lakemeyer</i>	
Stable Mapping Using a Hyper Particle Filter	252
<i>Johannes Pellenz and Dietrich Paulus</i>	
A Characterization of 3D Sensors for Response Robots	264
<i>Jann Poppinga, Andreas Birk, and Kaustubh Pathak</i>	
Multiple Model Kalman Filters: A Localization Technique for RoboCup Soccer	276
<i>Michael J. Quinlan and Richard H. Middleton</i>	
Integrated Genetic Algorithmic and Fuzzy Logic Approach for Decision Making of Police Force Agents in Rescue Simulation Environment	288
<i>Ashkan Radmand, Eslam Nazemi, and Mohammad Goodarzi</i>	

IntellWheels MMI: A Flexible Interface for an Intelligent Wheelchair . . .	296
<i>Luis Paulo Reis, Rodrigo A.M. Braga, Márcio Sousa, and Antonio Paulo Moreira</i>	
Analyzing the Human-Robot Interaction Abilities of a General-Purpose Social Robot in Different Naturalistic Environments	308
<i>J. Ruiz-del-Solar, M. Mascaró, M. Correa, F. Bernuy, R. Riquelme, and R. Verschae</i>	
Communicating among Robots in the RoboCup Middle-Size League . . .	320
<i>Frederico Santos, Luís Almeida, Luís Seabra Lopes, José Luís Azevedo, and M. Bernardo Cunha</i>	
Multi-robot Cooperative Object Localization: Decentralized Bayesian Approach	332
<i>João Santos and Pedro Lima</i>	
Evolution of Biped Walking Using Truncated Fourier Series and Particle Swarm Optimization	344
<i>Nima Shafii, Siavash Aslani, Omid Mohamad Nezami, and Saeed Shiry</i>	
Efficient Behavior Learning by Utilizing Estimated State Value of Self and Teammates	355
<i>Kouki Shimada, Yasutake Takahashi, and Minoru Asada</i>	
Sensor and Information Fusion Applied to a Robotic Soccer Team	366
<i>João Silva, Nuno Lau, João Rodrigues, José Luís Azevedo, and António J.R. Neves</i>	
Omnidirectional Walking Using ZMP and Preview Control for the NAO Humanoid Robot	378
<i>Johannes Strom, George Slavov, and Eric Chown</i>	
RoboCup@Home: Results in Benchmarking Domestic Service Robots . .	390
<i>Thomas Wisspeintner, Tijn van der Zan, Luca Iocchi, and Stefan Schiffer</i>	
Connecting the Real World with the Virtual World - Controlling AIBO through Second Life	402
<i>Evan Wong, Wei Liu, and Xiaoping Chen</i>	
A Hybrid Agent Simulation System of Rescue Simulation and USARSim Simulations from Going to Fire-Escape Doors to Evacuation to Shelters	414
<i>Masaru Okaya, Shigeru Yotsukura, and Tomoichi Takahashi</i>	

SSL-Vision: The Shared Vision System for the RoboCup Small Size League	425
<i>Stefan Zickler, Tim Laue, Oliver Birbach, Mahisorn Wongphati, and Manuela Veloso</i>	
Heuristic Formation Control in Multi-robot Systems Using Local Communication and Limited Identification	437
<i>Michael de Denu, John Anderson, and Jacky Baltes</i>	
Cooperative Multi-robot Map Merging Using Fast-SLAM	449
<i>N. Ergin Özkucur and H. Levent Akin</i>	
Author Index	461