



David Obdržálek Achim Gottscheber (Eds.)

# Research and Education in Robotics - EUROBOT 2010

International Conference

Rapperswil-Jona, Switzerland, May 27-30, 2010

Revised Selected Papers

## Volume Editors

David Obdržálek  
Charles University in Prague  
Faculty of Mathematics and Physics  
Malostranské náměstí 25  
118 00 Praha 1, Czech Republic  
E-mail: david.obdrzalek@mff.cuni.cz

Achim Gottscheber  
SRH University Heidelberg  
69121 Heidelberg, Germany  
E-mail: achim.gotscheber@fh-heidelberg.de

ISSN 1865-0929  
ISBN 978-3-642-27271-4  
DOI 10.1007/978-3-642-27272-1  
Springer Heidelberg Dordrecht London New York

e-ISSN 1865-0937  
e-ISBN 978-3-642-27272-1

Library of Congress Control Number: 2011943226

CR Subject Classification (1998): I.2.9, I.2, I.4, I.5, H.4, K.3, I.6

© Springer-Verlag Berlin Heidelberg 2011

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.

The use of general descriptive names, registered names, trademarks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

*Typesetting:* Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Preface

This volume contains the selected papers presented at the International Conference on Research and Education in Robotics—EUROBOT 2010—held in Rapperswil-Jona, Switzerland, May 27–30, 2010. The Conference was organized as part of the annual EUROBOT event.

A fundamental aspect of EUROBOT is promotion of science and technology among young students and researchers. Therefore, the conference was accompanied by the EUROBOT Autonomous Robot Contest (specifically its international finales): three best teams from each participating country brought their robots to the city of Rapperswil-Jona in Switzerland to meet their colleagues from all over the world—teams from 24 countries took part in 2010.

Besides the conference presentations, two invited talks were given by:

- Bruno Siciliano, Director of Prisma Lab, University of Naples, Italy
- Veronique Raoul, President of EUROBOT Association

The conference was supported by the EUROBOT Association, the town of Rapperswil-Jona, Switzerland, the HSR University of Applied Sciences Rapperswil, Switzerland, and the Charles University in Prague, Czech Republic.

We would like to thank everyone involved in the conference organization and in the whole EUROBOT event in Rapperswil-Jona. We also thank all the authors who submitted their work and the reviewers who helped select the best papers to be presented and be included in these proceedings. Last, but not least, we want to thank the developers of the EasyChair system, which was used as the main management tool for the conference papers.

May 2010

David Obdržálek  
Achim Gottscheber

# Organization

EUROBOT 2010 was organized by:

- EUROBOT Association
- SRH University Heidelberg, Germany
- Charles University in Prague, Czech Republic
- Hochschule für Technik Rapperswil, HSR/IMA, Rapperswil, Switzerland in cooperation with Planète Sciences Association, France.

## Executive Committee

### Conference Chair

Achim Gottscheber                      SRH University Heidelberg, Germany

### Program Chair

David Obdržálek                      Charles University in Prague, Czech Republic

### Local Organization

Agathe Koller                      Hochschule für Technik Rapperswil, HSR/IMA,  
Rapperswil, Switzerland

## Program Committee

Jacques Bally	Y-Parc, Parc Scientifique et Technologique, Yverdon-les-Bains, Switzerland
Kay Erik Böhnke	SRH University Heidelberg, Germany
Jean-Daniel Dessimoz	Western Switzerland University of Applied Sciences, HESSO HEIG-VD, Yverdon-les-Bains, Switzerland
Boualem Kazed	University of Blida, Algeria
Agathe Koller	Hochschule für Technik Rapperswil, HSR/IMA, Rapperswil, Switzerland
Markus Kottmann	Hochschule für Technik Rapperswil, HSR/IMA, Rapperswil, Switzerland
David Obdržálek	Charles University in Prague, Czech Republic
Julio Pastor Mendoza	Universidad de Alcalá, Madrid, Spain

# Table of Contents

Improved Image Dominant Plane Extraction for Robot Navigation . . . .	1
<i>Andrés Colín-Espinoza, Héctor Alejandro Montes-Venegas, and María Enriqueta Barilla-Pérez</i>	
Do Cognition and Robotics Share Common Ground? Some Answers from the MCS Perspective and an RH-Y Case Study . . . . .	14
<i>Jean-Daniel Dessimoz</i>	
Elements of Hybrid Control in Autonomous Systems and Cognitics . . . .	30
<i>Jean-Daniel Dessimoz</i>	
Mechanical Design and System Architecture of a Tracked Vehicle Robot for Urban Search and Rescue Operations . . . . .	46
<i>Raimund Edlinger, Andreas Pölzleithner, and Michael Zauner</i>	
Flexible Robot Strategy Design Using Belief-Desire-Intention Model . . . .	57
<i>Loris Fichera, Daniele Marletta, Vincenzo Nicosia, and Corrado Santoro</i>	
Using Quadtrees for Realtime Pathfinding in Indoor Environments . . . . .	72
<i>Julian Hirt, Dominik Gauggel, Jens Hensler, Michael Blaich, and Oliver Bittel</i>	
Robot Workshop and Contest for High-School Students Organized by “Politehnica” University of Bucharest . . . . .	79
<i>Sanda Paturca, Catalina Enescu, Constantin Ilas, and Alexandru Morega</i>	
Requirements and Solutions in Applied Robotics . . . . .	87
<i>Rahman Jamal</i>	
Estimation of Mobile Robot Pose from Optical Mouses . . . . .	93
<i>Lenka Mudrová, Jan Faigl, Jaroslav Halgašík, and Tomáš Krajník</i>	
Performance Comparison of Vision Sensors and Processing Power of Two Robotic Platforms for Obstacle Avoidance . . . . .	108
<i>Sanda Paturca, Dan Novischi, and Constantin Ilas</i>	
Combining Gaussian Processes and Conventional Path Planning in a Learning from Demonstration Framework . . . . .	118
<i>Markus Schneider, Richard Cubek, Tobias Fromm, and Wolfgang Ertel</i>	

Development, Realization and Control of a Mobile Robot . . . . .	130
<i>Ralf Stetter, Paweł Ziemniak, and Andreas Paczynski</i>	
Startup Robotics Course for Elementary School . . . . .	141
<i>Dmitry Sukhotskiy and Anton Yudin</i>	
Micromouse – Electronics on Wheels . . . . .	149
<i>Tony Wilcox</i>	
Autonomous Mobile Robot Development in a Team, Summarizing Our Approaches . . . . .	168
<i>Andrey Demidov, Andrey Kuturov, Anton Yudin, Boris Krasnobryzhiy, Mikhail Chistyakov, and Rustam Borovik</i>	
Distributed Control System in Mobile Robot Application: General Approach, Realization and Usage . . . . .	180
<i>Andrey Vlasov and Anton Yudin</i>	
A Modular and Scalable Electronic System for Mobile and Autonomous Robots . . . . .	193
<i>Raimund Edlinger and Michael Zauner</i>	
<b>Author Index</b> . . . . .	201