

PROCEEDINGS

darh2005

First International Conference on  
**Dextrous Autonomous Robots and  
Humanoids**

*Yverdon-les-Bains, 19 - 22 May 2005*

*Not just knowledge and mobility...  
Machine-based expertise and agility  
for goals and conditions set by humans  
...because time and purpose matter.*

*J.-D. Dessimoz, D. Obdržálek, and A. Perrenoud, Eds., Oct. 2005*

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# DARH2005 Conference

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## Welcome

Dear DARH2005 Participant,

Welcome to DARH2005 Conferences. For the Conferences, as expected, scientific exchanges between specialists are the goal. DARH2005 Conferences however happen in a broader context both at European and Swiss levels. Eurobot has been granted the support of the European Community, « Science Week » Program, in order to bring science closer to the citizen. Moreover, this year in Yverdon-les-Bains, the Eurobot finals are in the core of the « Science et Cité » festival, which is sponsored by Swiss federal Authorities, with aims similar to the ones of the European Community program. Indeed many activities relating to robots in the realms of art, science, technology, and education are organized these days in Yverdon-les-Bains. Welcome to this festival as well.

What is the scope of DARH2005 robotic Conferences? Machine dexterity and human aspects. Dexterity. We do not want to limit our search just to artificial knowledge and mobility, but rather, with more ambition, we aim at “machine-based *expertise* and *agility*”. This is important because in real life, time matters. Many of us have already contributed to Eurobot competitions. Collectively, we, at Eurobot, have already demonstrated so many dextrous, expert, agile, autonomous robots: think of all the systems that have been successfully engineered for grasping, throwing, pushing squash balls, tennis balls, rhythmic gymnastics balls, skittles, etc...; think about motions featuring accelerations very often higher than  $g$ ; think of the agile and effective possibilities demonstrated. E.g. to extend arms, cross narrow bridges, avoid obstacles and circulate through cramped ways up to the goals; consider the various embedded systems, adaptive implementation of strategies, decision processes, locomotion structures, etc... There is a lot of expertise to be documented, and a lot of exchanges to be made about dexterity.

DARH2005 is also the opportunity to expand Eurobot domain in the direction of humans. Purpose matters. Robots should act according to goals and conditions set by humans. For ultimate communication and cooperation possibilities of robots with respect to humans, a humanoid cognitive and kinematic platform is the ultimate solution. And we are fortunate enough that the current state of the art lies close to the boundary of practicality or in some limited cases even already provide a foothold in it. Our colleagues of Robocup obviously share this view.

Now let us see the program. The DARH2005 Conferences feature five Highlight Lectures open to the public, relating to mobile robots, space, and humanoids. But mostly, the conferences address more specific, scientific issues: They include two Keynote Lectures reporting for one, on trajectory computation for cooperating robots; and for the other one, on cognitive approaches for developmental robotics. DARH2005 Conferences mainly consist in seven different sessions where are discussed cognitics, autonomous robots, humanoids, and more singular aspects namely advanced control architectures, some advanced applications, as well as fuzzy-logic, neural and genetic techniques.

Beside DARH2005 Conferences and discussions, I hope that you will take advantage of the workshop opportunities, competitions and demos, that you will benefit from the wide offering of other events relating to robots, also in arts and education, and that maybe you will even go out and explore the beautiful region of Yverdon-les-Bains, with its lake and neighbouring mountains.

Jean-Daniel Dessimoz, Chairman of DARH2005

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**Highlight Lectures**

**1 Astronauts and Robots**

Claude Nicollier, ESA, CB/NASA, Johnson Space Center, Houston, Texas, USA ;  
Space Center, EPFL, Switzerland.

**2 RoboCup : The evolution of a Robotic Scientific Challenge**

Fernando Ribeiro, University of Minho, Portugal

**3 Cognitive Developmental Robotics**

Minoru Asada, Osaka University, Suita, Osaka

**4 Roboka Contest : « Judo » by Virtual Humanoid Robots on the Internet**

Olivier Michel, Cyberbotics S.à r.l., Switzerland

## **1 Motion Planning and Cognitics**

Co-Chairs : A. Bonarini, J.-D. Dessimoz

### **1.1 KEYNOTE : Motion Planning : State of the Art and Perspectives**

Jean-Paul Laumond, LAAS-CNRS, Toulouse, France

### **1.2 About the Necessary Move from Cognitics to Ethics ; Additional Definitions and Contributions to Metrics in MCS**

Jean-Daniel Dessimoz, HES-SO - HEIG, Yverdon-les-Bains, Switzerland

## **2 Autonomous Mobile Robots**

Co-Chairs : G. Muscato, D. Obdržálek

### **2.1 Climbing Robot Competition experience at University of Catania**

Domenico Longo, Giovanni Muscato, DIEES, University of Catania, Italy

### **2.2 Map Recall Based on Hierarchical Associative Memories**

Jana Štanclova, David Obdržálek, Charles University, Prague, Czech Republic

### **2.3 A Multilayered Neural Network Adaptive Controller for Robot Manipulators**

Badia Amrouche, Renewable Energy Development Centre, Algiers, Algeria  
Boualem Kazed, Saad Dahlab University, Blida, Algeria

### **2.4 Lomu, an Autonomous Mobile Robot with Robust Architecture and Components**

Nicolas Uebelhart, Florian Glardon, Pierre-François Gauthey,  
HES-SO / HEIG / EIVD, Yverdon-les-Bains, Switzerland

### 3 Humanoids

Co-Chairs : B. Borovac, J. Pastor

**3.1 Contribution to the Study of the Synthesis of Biped Motion with Enhanced Degree of Anthropomorphism**

Miomir Vukobrativić, Institute Mihajlo Pupin, Belgrade, Serbia and Montenegro,  
Branislav Borovac, Kalman Babković,  
University of Novi Sad, Serbia and Montenegro

**3.2 Using Handheld Computers to Control Humanoid Robots**

Sven Behnke, Jürgen Müller, Michael Schreiber  
University of Freiburg, Germany

**3.3 Real-Time Communications in a Small Biped Robot YABIRO**

M. Albero, F. Blanes, G. Benet, P. Pérez, J.E. Simó, J. Coronel  
Universidad Politécnica de Valencia, Spain

**3.4 Enabling a Humanoid Robot to Interact with Multiple Persons**

Maren Bennewitz, Felix Faber, Dominik Joho, Michael Schreiber, Sven Behnke,  
University of Freiburg, Germany



## **4 Fuzzy, Neural and Genetic Control**

Co-Chair : J. Lottin, B. Kazed

**4.1** (Cancelled)

**4.2 Establishment of a fuzzy algorithm in a mobile robot for the detection and the avoidance of an obstacle using HC12 Compact interface**

Benhelal Bilel, University of Saad Dahlab, Blida, Algeria

**4.3 Neural Motion Controller for Robots Daisy and Ester**

Zbyněk Winkler, Iveta Mrázová, Jiří Iša, Jakub Krchák  
Charles University, Prague, Czech Republic

## 5 Advanced Control Architecture

Co-Chair : R. Biesenbach, G. Muscato

**5.1 A New Modular Architecture for the Mobile Robot MORDUC: from the Hardware to the SLAM Algorithm**

Daniele Catlabiano, Giovanni Muscato, DIEES University of Catania, Italy

**5.2 Design and implementation of an intelligent predictive controller towards vision based application**

Raşit Köker, Server Firat, Sakarya University, Sakarya, Turkey  
Mesut Kahrıman, Fatih Technical High School, Sakarya, Turkey

**5.3 Fabrication and Control of a 4-DOF, Autonomous Robotic Arm Using Low Cost AVR Controller**

Javaid Iqbal, Nida Hassan, Atif Waqar, Sophia Bano, Rashid Ilyas  
College of EME, Rawalpindi, Pakistan

**5.4 Advanced control structure for the autonomous mobile robot LODUR**

Pierre Maurer, HES-SO / HEIG / EIVD, Yverdon-les-Bains, Switzerland

**5.5 A framework for rovers' navigation and obstacle avoidance**

E. Burattini, P. Coraggio, A. De Santis, B. Siciliano,  
Università di Napoli Federico II, Napoli, Italy

## 6 Advanced and Planetary Applications

Co-Chair : D. Obdržálek, F. Ribeiro

**6.1 Tracking the Absolute Position of a Mobile Robot Using Vision-Based Monte Carlo Localization**

Jan Benda, Zbyněk Winkler,  
Charles University, Prague, Czech Republic

**6.2 Control of Omni-Directional Mobile Platform with Four Driving Wheels**

Takao Nakazato, Sonia von Wyl, Hisahi Osumi, Chuo University, Tokyo, Japan.  
Jean-Daniel Dessimoz, HES-SO / HEIG / EIVD, Yverdon-les-Bains, Switzerland

**6.3 Modelling and animation of virtual planetary rovers in simulated world for evaluation of locomotion structures**

Nicolas Uebelhart, HES-SO / HEIG / EIVD, Yverdon-les-Bains, Switzerland  
Stéphane Michaud, Contraves Space Center, Zurich,  
Olivier Michel, Cyberbotics S.à r.l., Switzerland

**6.4 Overconstrained Wheeled Vehicles: A Simpler Rocky 7 - The Kinematic Car**

Neeraj Singh Gautam, Prashant Awadhiya  
Government Engineering College, Raipur, India