



ISRR 2009

International Symposium of **Robotics Research**
August 31- September 3, 2009, Lucerne, Switzerland

ISRR 2009 booklet

The
14th International Symposium on Robotics Research
(ISRR 2009)
is hosted by the Institute of Robotics and Intelligent Systems, ETH Zurich. The
meeting will be held in
Lucerne, Switzerland, on
August 31 - September 3, 2009

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14th International Symposium of Robotics Research



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Sponsors

We'd like to thank our sponsors for their generous support:

- **ETH Zurich, Institute of Robotics and Intelligent Systems**
- **ASL Autonomous Systems Lab**
- **DLR Institute of Robotics and Mechatronics**
- **International Foundation of Robotics Research (IFRR)**
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1 Some Important Facts about ISRR 2009

Conference site

ISRR 2009 will be held at the **Hotel Astoria** in the center of Lucerne (see map and travel information in Section 2).

Important dates

Sunday August 30, 7.00 pm	Welcome Reception
Monday, August 31 st – Thursday September 3 rd	Conference
Monday August 31 st , 6.30 pm	Beach BBQ
Tuesday September 1 st , from 13.40 pm	Blue Sky session (up Mount Pilatus) and Banquet
Wednesday September 2 nd , 9.00 pm	Video session / Wine and cheese

Opening hours of the registration desk

Sunday August 30 rd	18.00 – 20.00
Monday, August 31 st	07.45 – 16.00 17.30 – 18.00
Tuesday September 1 st	08.00 – 08.30 Plus during coffee breaks/ lunch
Wednesday September 2 nd	08.00 – 08.30 Plus during coffee breaks/ lunch
Thursday September 3 rd	08.00 – 08.30 Plus during coffee break/ lunch

Phone, fax and e-mail at Hotel Astoria

Phone: + 41 41 226 88 00

Fax: +41 41 226 88 90

E-mail: isrr2009@mavt.ethz.ch



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2 Travel Information

The international airports in Zurich, Basel and Geneva are only a short trip by car to Lucerne, and are also well connected with direct fast trains.

Distances:

Airport Zurich: 65 km

Airport Geneva: 250 km

Airport Basel: 110 km

From Zurich Airport to Lucerne

We recommend approaching Switzerland through Zurich International Airport.

Local trains between Zurich Airport and Zurich Main Station (Zürich Hauptbahnhof) are operated at a high frequency. Direct trains connect Zurich and Lucerne within approximately 60 minutes. Trains for Lucerne leave from Zurich Main Station at an hourly basis. You can purchase a train ticket Zürich Flughafen-Luzern (from Zurich airport to Lucerne) for CHF 27 one way, 2nd class (CHF 45 in 1st class). The whole trip will take approximately 1h15.

Here is the timetable of all the direct trains from Zurich Main Station to Lucerne.



Zurich HB – Lucerne

Dep.	Arr.	Duration	Special
2.30	3.22	0.52	Sat, Sun
5.35	6.25	0.50	daily
6.04	6.49	0.45	daily
6.35	7.25	0.50	daily
7.04	7.49	0.45	daily
7.35	8.25	0.50	daily
8.04	8.49	0.45	daily
8.35	9.25	0.50	daily
9.04	9.49	0.45	daily
9.35	10.25	0.50	daily
10.04	10.49	0.45	daily
10.35	11.25	0.50	daily
11.04	11.49	0.45	daily
11.35	12.25	0.50	daily
12.04	12.49	0.45	daily
12.35	13.25	0.50	daily
13.04	13.49	0.45	daily
13.35	14.25	0.50	daily
14.04	14.49	0.45	daily
14.35	15.25	0.50	daily
15.04	15.49	0.45	daily
15.35	16.25	0.50	daily
16.04	16.49	0.45	daily
16.35	17.25	0.50	daily
16.41	17.39	0.58	Mon-Fri
17.04	17.49	0.45	daily
17.35	18.25	0.50	daily
17.41	18.39	0.58	Mon-Fri
18.04	18.49	0.45	daily
18.35	19.25	0.50	daily
18.41	19.39	0.58	Mon-Fri
19.04	19.49	0.45	daily
19.35	20.25	0.50	daily
20.04	20.49	0.45	daily
20.35	21.25	0.50	daily
21.04	21.49	0.45	daily
21.35	22.25	0.50	daily
22.04	22.49	0.45	daily
22.35	23.25	0.50	daily
23.04	23.49	0.45	daily
23.35	0.25	0.50	daily

Lucerne – Zurich HB

Dep.	Arr.	Duration	Special
1.01	1.53	0.52	Sa, So
4.55	5.55	1.00	daily
5.28	6.25	0.57	daily
6.10	6.56	0.46	daily
6.20	7.19	0.59	Mon-Fri
6.35	7.25	0.50	daily
7.10	7.56	0.46	daily
7.20	8.19	0.59	Mon-Fri
7.35	8.25	0.50	daily
8.10	8.56	0.46	daily
8.35	9.25	0.50	daily
9.10	9.56	0.46	daily
9.35	10.25	0.50	daily
10.10	10.56	0.46	daily
10.35	11.25	0.50	daily
11.10	11.56	0.46	daily
11.35	12.25	0.50	daily
12.10	12.56	0.46	daily
12.35	13.25	0.50	daily
13.10	13.56	0.46	daily
13.35	14.25	0.50	daily
14.10	14.56	0.46	daily
14.35	15.25	0.50	daily
15.10	15.56	0.46	daily
15.35	16.25	0.50	daily
16.10	16.56	0.46	daily
16.35	17.25	0.50	daily
17.10	17.56	0.46	daily
17.35	18.25	0.50	daily
18.10	18.56	0.46	daily
18.35	19.25	0.50	daily
19.10	19.56	0.46	daily
19.35	20.25	0.50	daily
20.10	20.56	0.46	daily
20.35	21.25	0.50	daily
21.10	21.56	0.46	daily
21.35	22.25	0.50	daily
22.10	22.56	0.46	daily
22.35	23.25	0.50	daily
23.10	23.56	0.46	daily
23.35	0.25	0.50	daily



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From Basel Euroairport

EuroAirport is not linked directly to the railway system, but there are connections by bus to the railway station in Basel. The bus line 50 runs every 10 minutes from 5am to midnight and links the Euroairport to Basel Main Station (Bahnhof SBB) in approximately 20 minutes. A direct trip from Basel SBB to Lucerne can last 1h to 1h30, depending on the train.

For detailed information on the train schedule and for booking your train ticket in advance, please visit the SBB portal <http://www.sbb.ch/en/index.htm>.

From Geneva International Airport

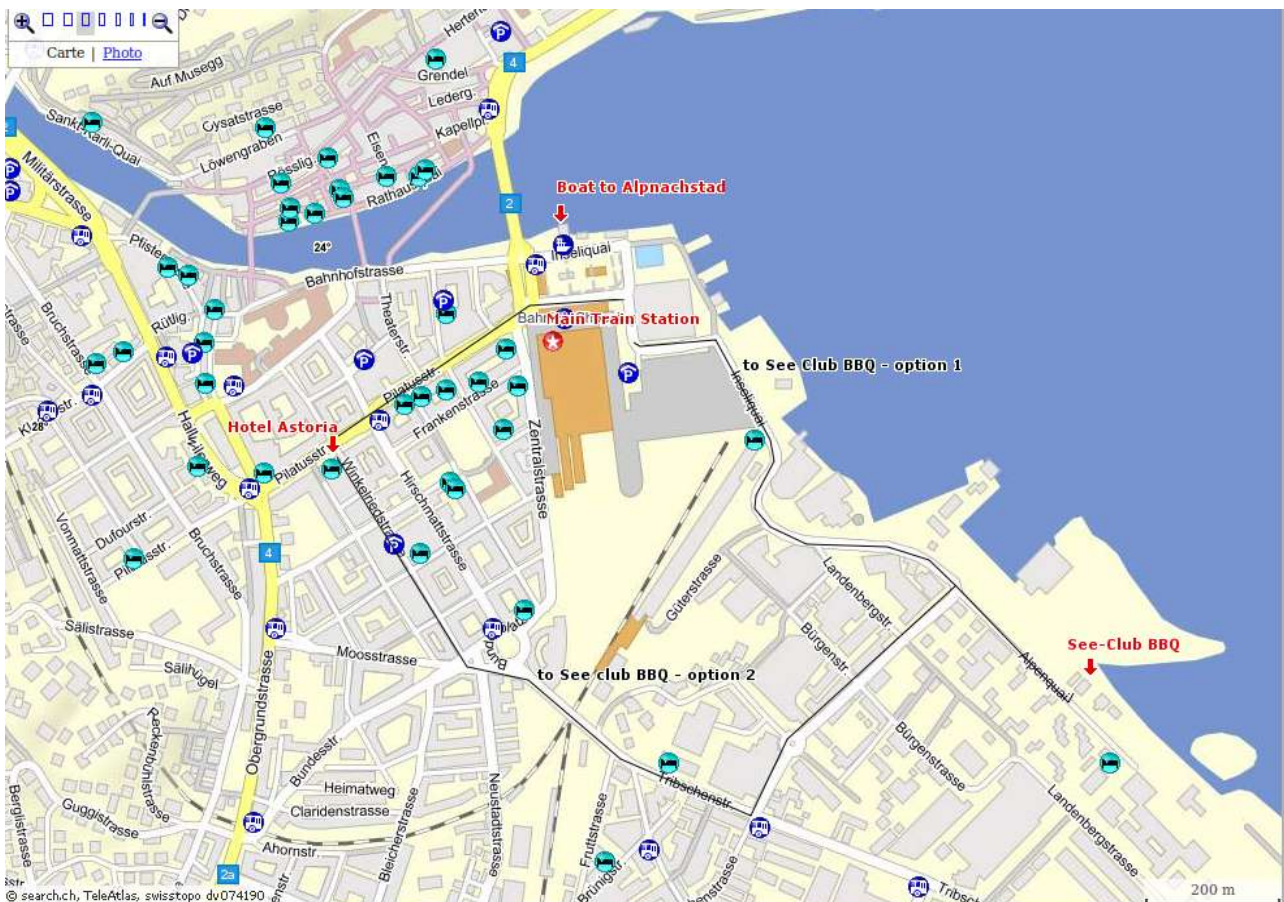
The airport offers connections to the Swiss rail network but reaching Lucerne will most of the times require one or more connections and take at least 3 hours.

The CFF airport railway station has direct access to the airport Check-in and Arrival levels. All trains stop at Geneva-Cornavin station (city centre). Tickets can be purchased from the machines located in the station (CHF, Euro or credit cards), from the station counters and also from the CFF Ticket Shop.



In Lucerne

The conference site (hotel Astoria) is located in the heart of Lucerne, within only 5 minutes walking distance from Lucerne Main Train Station.



Parking possibilities

A few covered parking spaces are available upon request and reservation at the Hotel Astoria. They cost 35 CHF per day. Nearby public (paying) car parks are also indicated on the map above.



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3 The Blue Sky Session and Banquet on Mount Pilatus

A “Blue Sky Session” and the conference Banquet will be held on Tuesday, September 1st, on Mount Pilatus, which offers a spectacular panoramic view of the Alpine Range, the Black Forest and 6 Swiss lakes.

How to get there

To reach the banquet location, you will enjoy a 90min boat trip from Lucerne to Alpnachstad, where you will then catch the world's steepest cogwheel railway for a 30min drive to the top of Mount Pilatus. You will get the tickets at the registration desk with the rest of the material or – depending on the delivery of the tickets – it will be given to you at the boat station. Your boat will leave from Lucerne boat station at 13:40 (see map in section

In the unfortunate event that you miss it, you can reach Alpnachstad in 20 min catching a S5 train from Lucerne Train Station (you will need to buy your own ticket for this trip). The S5 leaves twice every hour, at 08 past and 37 past. Once arrived at Alpnachstad, you will find the Cogwheel Railway Station nearby the train station.



After the banquet, a late aerial cabin and a bus, especially booked for the ISRR participants, will take you back to Lucerne.



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4 Guidelines and Equipment for Presentations

- **Please contact your chairman before the start of your session.**
- Each presentation is scheduled according to the program. Please prepare your presentation accordingly.
- The presentation room will be equipped with an overhead projector and a beamer for presenting from your own laptop. If you need specific equipment, please inform us well in advance (isrr2009@mavt.ethz.ch).
- Please inform us as soon as possible if you have any problem with your presentation time.

5 Other Useful Information

Climate

The climate in Switzerland is usually pretty nice and warm with little rain at the beginning of September. You may expect temperatures between 20°C and 30°C during the day and around 15°C at night in Lucerne, but it can also be colder, so be prepared for surprises. Bring a jumper and a raincoat, as rain is not unlikely either. Don't forget that the weather will be colder on top of Mount Pilatus, where the temperatures may range between 10°C and 20°C, even less at night.

Tourism in Lucerne and around

- Both the city of Lucerne and the Lake Lucerne Region are often referred to as the "essence of Switzerland". In a small amount of space, this region embodies almost everything that is a part of Switzerland: a city whose old town dates back to the Middle Ages, a lake with Europe's most extensive inland navigation and a panorama of the Alps, all of which provides an ideal setting for combining excursions and allowing the visitor to explore and experience the Lake Lucerne Region from a different angle.
- Lucerne has a vast number of monuments worthy of a sightseeing trip. Stroll through the narrow lanes of the city and discover your own favourites.
- The city also counts a great variety of museums: arts, history, nature, transports...

For more information please have a look at the tourist office website: <http://www.luzern.org/en/navpage-ExcursionsLU.html>. Further information will also be



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available at your hotel and at the Tourist Office inside the Train Station (open from 8.30 to 19.30 everyday).

Luzern Tourismus AG
Tourist Board
Zentralstrasse 5
CH-6003 Luzern
Phone +41 (0)41 227 17 17
Fax +41 (0)41 227 17 20
luzern@luzern.com

Power Plugs

- **Be aware that Switzerland has an own power plug system. So please bring your international plug with you.**



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6 Technical Program of ISRR 2009

Sunday August 30rd, 2009

18.00	Registration Desk open	In front of Conference Room 2 - 7th floor, Hotel Astoria
19.00	Welcome drink	Penthouse - 8th floor, Hotel Astoria

Monday August 31st, 2009

8.30 - Session M1: Navigation

T1	Reciprocal n-body Collision Avoidance	Jur van den Berg, Stephen Guy, Ming Lin, Dinesh Manocha - UNC Chapel Hill
T2	Unifying Geometric, Probabilistic and Potential Field Approaches to Multi-Robot Coverage Control	Mac Schwager, Jean-Jacques Slotine, Daniela Rus - MIT
T3	Design and Development of an Optimal-Control-Based Framework for Trajectory Planning, Threat Assessment, and Semi-Autonomous Control of Passenger Vehicles and Hazard Avoidance Scenarios	Sterling Anderson, Steven Peters, Tom Pilutti, Karl Iagnemma - MIT
T4 <i>Invited Talk</i>	Learning Landmark Selection Policies for Mapping Unknown Environments	Hauke Strasdat, Cyrill Stachniss, Wolfram Burgard - University of Freiburg
10.00	Coffee break (Foyer)	

10.30 - Session M2: Rough Navigation

T1	Gait Transitions for Quasi-Static Hexapedal Locomotion on Level Ground	Galen Haynes, Fred Cohen, Daniel Koditschek - University of Pennsylvania
T2	Stable Dynamic Walking over Rough Terrain	Ian Manchester, Uwe Mettin, Fumiya Iida, Russ Tedrake - Umea University
T3 <i>Invited Talk</i>	Learning to Fly Like a Bird	Russ Tedrake - MIT
T4 <i>Invited Talk</i>	Environment modeling for cooperative air/ground robotic systems	Simon Lacroix - LAAS-CNRS
T5 <i>Invited Talk</i>	Design and Analysis of Hybrid Systems, with Applications to Robotic Aerial Vehicles	Jeremy Gillula, Haomiao Huang, Michael Vitus, Claire Tomlin - UC Berkeley
12:20	Lunch – Penthouse, 7th floor	

13.30 - Session M3: Human Robot Interface

T1 <i>Invited Talk</i>	Social Learning Mechanisms for Robots	Andrea Thomaz, Maya Cakmak - Georgia Tech
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T2	Real-Time Photorealistic Virtualized Reality Interface For Remote Mobile Robot Control	Alonzo Kelly, Erin Capstick, Daniel Huber, Herman Herman, Pete Rander, Randy Warner - CMU
T3 <i>Invited Talk</i>	Robot Audition: Missing Feature Theory Approach and Active Audition	Hiroshi Okuno, Kazuhiro Nakadai, Hyun-Don Kim - Kyoto University
T4 <i>Invited Talk</i>	Learning Visual Representations for Interactive Systems	Justus Piater, Sébastien Jodogne, Renaud Detry, Dirk Kraft, Norbert Krüger, Oliver Kroemer, Jan Peters - University of Liege
15.00	Coffee break – (Foyer)	

15:30 - Session M4: Robotic Manipulation

T1	Towards the Robotic Co-Worker	Sami Haddadin, Michael Suppa, Stefan Fuchs, Alin Albu-Schaeffer, Gerd Hirzinger - DLR
T2 <i>Invited Talk</i>	Haptography: Capturing and Recreating the Rich Feel of Real Surfaces	Katherine Kuchenbecker, Joseph Romano, William McMahan - University of Pennsylvania
T3 <i>Invited Talk</i>	A Factorization Approach to Manipulation in Unstructured Environments	Dov Katz, Oliver Brock - University of Massachusetts
T4 <i>Invited Talk</i>	Anthropomorphic Soft Robotics - from Torque Control to Variable Intrinsic Compliance	Alin Albu-Schaeffer, Oliver Eiberger, Matthias Fuchs, Markus Grebenstein, Sami Haddadin, Christian Ott, Andreas Stemmer, Thomas Wimböck, Sebastian Wolf, Gerd Hirzinger-Schaeffer - DLR
18.30	Departure for the Evening BBQ Meeting at Hotel Astoria, Lobby	

Tuesday September 1st, 2009

8.30 - Session Tu1: Humanoid

T1 <i>Invited Talk</i>	Enhanced Mother Environment with Humanoid Specialization in IRT Robot Systems	Masayuki Inaba - University of Tokyo
T2 <i>Invited Talk</i>	Cybernetic Human HRP-4C: A humanoid robot with human-like proportions	Shuuji Kajita, Kenji Kaneko, Fumio Kanehiro, Kensuke Harada, Mitsuharu Morisawa, Shin'ichiro Nakaoka, Kanako Miura, Kiyoshi Fujiwara, Ee Sian Neo, Isao Hara - AIST
T3 <i>Invited Talk</i>	Developing cognitive skills on a child humanoid robot: the iCub	Giulio Sandini - Italian Institute of Technology
T4 <i>Invited Talk</i>	From Sensorimotor Primitives to Manipulation and Imitation Strategies in Humanoid Robots	Tamim Asfour - University of Karlsruhe
10.00	Coffee break (Foyer)	



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10.30 - Session Tu2: Learning

T1	Learning Mobile Robot Motion Control from Demonstrated Primitives and Human Feedback	Brenna Argall, Brett Browning, Manuela Veloso - CMU
T2	Perceptual Interpretation for Autonomous Navigation through Dynamic Imitation Learning	Silver David, J. Andrew Bagnell, Anthony Stentz - CMU
T3	An inverse optimal control approach to human motion modeling	Katja Mombaur, Jean-Paul Laumond, Anh Truong - LAAS
T4 <i>Invited Talk</i>	Towards Motor Skill Learning for Robotics	Jan Peters, Jens Kober, Katharina Muelling, Duy Nguyen-Tuong, Oliver Kroemer - Max Plant Institute
12:00	Individual lunch	

13.40 - Boat Trip to Alpnachstad

15.50 - Travel to Mount Pilatus

16.30 - Welcome Drink on Pilatus Kulm

17.00 - Blue Sky Session

Hugh Durrant Whyte: Sensor Fusion
Vijay Kumar: Multi-robot coordination
Brad Nelson: Micro and Nano-Robotics
Stefan Schaal: Robot Learning
Sebastian Thrun: Probabilistic Robotics
Makoto Kaneko: Human Centered Robotics

19.30 - Banquet

23.30 - Return to Lucerne

Wednesday September 2nd, 2009

8.30 - Session W1: Mapping

T1	Autonomy through SLAM for an Underwater Robot	John Folkesson, John Leonard - MIT
T2	Toward Life Long Mapping	Paul Newman, Gabe Sibley, Mark Cummins, Mike Smith, Alastair Harrison, Christopher Mei, Ian Reid - University of Oxford
T3	Error Driven Densification of Multi-scale Gaussian Maps	Manuel Yguel, Dizan Vasquez, Olivier Aycard, Roland Siegwart, Christian Laugier - INRIA

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T4 <i>Invited Talk</i>	Towards Lifelong Navigation and Mapping in an Office Environment	Gordon Wyeth, Michael Milford - University of Queensland
10.00	Coffee break (Foyer)	

10.30 - Session W2: Vision

T1	Estimating Ego-Motion in Panoramic Image Sequences with Inertial Measurements	Felix Schill, Robert Mahony, Peter Corke - ANU
T2	Reconstruction and Verification of 3D Object Models for Grasping	Zoltan Marton, Lucian Goron, Radu Rusu, Michael Beetz - TUM
T3 <i>Invited Talk</i>	Robust 3-D Visual SLAM in a Large-scale Environment"	Jungho Kim, Kuk-Jin Yoon, In So Kweon - KAIST
T4 <i>Invited Talk</i>	Large-Scale Visual Mapping and Localization	Marc Pollefeys - ETHZ
12.00	Lunch – Penthouse, 7th floor	

13.30 - Session W3: Tracking and Sensor Network

T1	Efficient Strategies for Collecting Data from Wireless Sensor Network Nodes using Mobile Robots	Onur Tekdas, Nikhil Karnad, Volkan Isler - University of Minnesota
T2	Place-Dependent People Tracking	Matthias Luber, Gian Diego Tipaldi, Kai Arras - University of Freiburg
T3 <i>Invited Talk</i>	Combining Laser-Scanning Data and Images for Target Tracking and Scene Modeling	Hongbin Zha, Huijing Zhao, Jinshi Cui, Xuan Song, Xianghua Ying - Peking University
T4 <i>Invited Talk</i>	Sensing and Control on the Sphere	Peter Corke, Robert Mahony - CSIRO
15.00	Coffee break – (Foyer)	

15.30 - Session W4: Complex Motion

T1	Floating Visual Grasp of Unknown Objects Using an Elastic Reconstruction Surface	Lippiello Vincenzo, Fabio Ruggiero, Bruno Siciliano - UNINA
T2	Motion Planning under Uncertainty for Robotic Tasks with Long Time Horizons	Hanna Kurniawati, Yanzhu Du, Wee Sun Lee, David Hsu, Shao Wei Png, Sylvie C. W. Ong - MIT
T3	Generality and Simple Hands	Matthew Mason, Siddhartha Srinivasa, Andres Vazquez - CMU
T4 <i>Invited Talk</i>	Scansorial Landing and Perching	Mark Cutkosky, Alan Asbeck, Alexis Lussier Desbiens - Stanford University
17.00	End of session - Individual dinner	
21.00	Video session + Wine & Cheese Tasting Conference Room	Sponsored by Maxon Motors



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Thursday September 3rd, 2009

8.30 - Session Th1: Multi-Robot Systems

T1	Coordinating Construction of Truss Structures using Distributed Equal-mass Partitioning	Seungkook Yun, Mac Schwager, Daniela Rus - MIT
T2	Synthesis of Controllers to Create, Maintain, and Reconfigure Robot Formations with Communication Co	Nora Ayanian, Vijay Kumar, Daniel Koditschek - University of Pennsylvania
T3	Planning and Control for Cooperative Manipulation and Transportation with Aerial Robots	Jonathan Fink, Nathan Michael, Soonkyum Kim, Vijay Kumar - University of Pennsylvania
T4 <i>Invited Talk</i>	Towards a Ten Thousand Mobile Robot Warehouse	Raffaello D'Andrea - ETHZ
10.00	Coffee break (Foyer)	

10.30 - Session Th2: Micro/Nano Robots

T1	"Design and Fabrication of the Harvard Ambulatory Micro-Robot"	Andrew Baisch, Robert Wood - Harvard University
T2 <i>Invited Talk</i>	"On-chip Robotics for Biomedical Innovation"	Fumihito Arai - Tohoku University
T3 <i>Invited Talk</i>	"Assembly and Disassembly of Magnetic Mobile Micro-Robots towards 2-D Reconfigurable Micro-Systems"	Chytra Pawashe, Steven Floyd, Metin Sitti - CMU
12.00	End of the Conference	