Robotics and Autonomous Systems Journal

Special Issue on “Emerging Spatial Competences: From Machine Perception to Sensorimotor Intelligence”

CALL FOR PAPERS

Aims and Objectives

Following the recent evolution of robotics and AI in different fields of application, the increasing complexity of the actions that an artificial agent needs to perform, is directly dependent on the complexity of the sensory information that it can acquire and interpret, i.e. perceive.

From this point of view, an efficient and internal representation of the sensory information is at the base of a robot to develop a human-like capability of interaction with the surrounding environment. Particularly, in the space at a reachable distance, not only visual and auditory, but also tactile and proprioceptive information rise to be relevant to gain a comprehensive spatial cognition. This information, coming from different senses, can be in principle integrated and used to experience an awareness of the environment both to actively interact with it, and to calibrate the interaction itself. Besides, the early sensory and sensorimotor mechanisms, that at a first glance may appear simple processes, are grounded on highly structured and complex algorithms that are far from being understood and modeled. By exploiting an early synergy between sensing modules and motor control, the loop between action and perception comes to be not just closed at system level, but shortened at an inner one. This would allow not only the emergence of spatial competences but also their continuous adaptation to changes in the environment or in the body, which could modify its interactions with the world.

The aim of this special issue is to survey a state of the art of methodologies, concepts, algorithms and techniques that would serve as bricks on which to build and develop artificial agents with such a spatial competence; perceptual and cognitive understanding of space should emerge from sensorimotor exercise.

The action-perception loop has never been so close!

Paper Submission

We invite original contributions that provide novel solutions to address the relevant topics including but not limited to:

- Theoretical or practical aspects of machine sensing (for computer vision, robot audition, artificial touch, etc.)
- Multisensory data fusion, processing, learning and integration

- Computational neural modeling
- Embodied robotics: perception, cognition, and behaviors
- Machine learning for sensorimotor control and intelligence
- Neural networks: models, theories, learning algorithms and applications
- Engineering application of sensorimotor intelligence to pattern recognition, computer vision, speech recognition, human-robot interactions.

As a follow-up of the IJCNN 2013 special session, we invite in particular the special session participants to submit profoundly extended versions of their conference submission to go through a new peer review process, together with contributions not published in the conference proceedings.

Papers should be typeset according to the format instructions for the Robotics and Autonomous Systems Journal, available on the Elsevier web site (http://www.elsevier.com/journals/robotics-and-autonomous-systems/0921-8890/guide-for-authors).

Important Dates

- January 31, 2014: Paper submission deadline
- March 31, 2014: Notification of paper acceptance
- April 30, 2014: Camera ready paper submission
- Late Spring 2014: Expected publication date

Guest editors

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Agostino Gibaldi received his degree in Biomedical Engineering from the University of Genoa, Italy, in 2007, and his Ph.D. in 2011. Since the master thesis he is with the Physical Structure of Perception and Computation (PSPC) Group where he is actually a post doc. Recently, he joined the Computer Vision Group of the Advanced Research Center on Electronic Systems (ARCES), working on data analysis computer aided diagnosis for CT perfusion related to tumour lesions. His research interests are related to cortical models of V1, MT and MST areas, in relation with the estimation of disparity, the control of vergence eye movements, and the optic flow analysis for navigation, for their real-time implementation on robot platforms so to obtain active behaviours and adaptation to the environment. Aside, he also worked on neural networks and learning, eye tracking algorithms, camera calibration, 3D data modelling for virtual reality, CT perfusion and image registration.

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the “physicalist” nature of the information processing occurring in the visual cortex, to understand the signal processing strategies adopted by the brain, and to build novel algorithms and architectures for artificial perception machines. His research interests relate to visual coding and multidimensional signal representation, early-cognitive models for visually-guided behavior, and robot vision. He is author of more than 100 papers in peer-reviewed journals, book chapters and international conference proceedings.

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Zhengping Ji received his B.S. degree in Electrical Engineering from Sichuan University, China, in 2003 and the Ph.D. in Computer Science from Michigan State University, USA, in 2008. From 2009 to 2010, he held a postdoctoral fellow position at the Center for the Neural Basis of Cognition, Carnegie Mellon University, working on the DARPA RealNose Project. After that, he spent two years in Los Alamos National Laboratory, where he was a Research Associate conducting researches on computational modelling of the brain’s visual pathways. He is now a Senior Research Scientist at Advanced Image Research Laboratory of Samsung Electronics. His current research interests lie in computer vision, computational neuroscience and machine learning. Specifically, he seeks to develop a series of deep learning models to generate cortex-like hierarchical sparse representation for a variety of tasks in vision, including generic object recognition, object detection and segmentation, image denoising and compression, and vision-based autonomous navigation. He is a Vice Chair of Task Force on Bio-Inspired Self-Organizing Collective Systems at IEEE Computational Intelligence Society, and a committee member of the Brain-Mind Institute, USA.