



Embedded Systems and Robotics Laboratory

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2010 IEEE International Conference on Robotics and Automation

Anchorage, Alaska, May 3-8, 2010

Workshop on Bio-Inspired Self-Organizing Robotic Systems

Due to the tight schedule, we have extended the workshop time, now it is 1:30pm - 7pm.

The detailed schedule:

- "Evolution of Altruistic Robot Teams: From Biology to Applications" (1:30pm - 2:00pm)
[Prof. Dario Floreano](#) and Prof. Laurent Keller, Laboratory of Intelligent Systems, EPFL, Switzerland.
- "Self-Reconfigurable Robots and Digital Hormones" (2:00pm - 2:30pm)
[Prof. Wei-Min Shen](#), Polymorphic Robotics Laboratory, University of Southern California, USA.
- "Morphogenetic Robotics: An Emerging Field in Developmental Robotics" (2:30pm - 3:00pm)
[Dr. Yaochu Jin](#) (Honda Research Institute Europe, Germany) and Prof. Yan Meng (Stevens Institute of Technology, USA).
- "A Reconfigurable Modular Robot using a Multi-cellular Mechanism" (3:00pm - 3:30pm)
[Prof. Yan Meng](#) (Stevens Institute of Technology, USA) and Dr. Yaochu Jin (Honda Research Institute Europe, Germany).
- Break (3:30pm - 4:00pm)
- "Cortex-Inspired Where-What Networks for Robots" (4:00pm - 4:30pm)
[Prof. Juyang Weng](#), Embodied Intelligence Laboratory, Michigan State University, USA.
- "Finding New Bio-Inspired Algorithms for Evolutionary Robotics and Swarm Robotics" (4:30pm - 4:50pm)
[Dr. Thomas Schmickl](#), Artificial Life Laboratory, University of Graz, Austria.
- "From Biology to Robotics, and Back" (4:50pm - 5:10pm)
[Dr. Simon Garnier](#), Princeton University, USA.
- "Multi-Robot Organisms: Bio-inspired and Evolutionary Paradigms" (5:10pm - 5:30pm)
[Dr. Serge Kernbach](#), Institute of Parallel and Distributed Systems, Universität Stuttgart, Germany.
- "Flocking Control of Swarm Robot in Noisy Environment" (5:30pm - 5:50pm)
[Prof. Weihua Sheng](#), Oklahoma State University, USA
- "The Problems Towards Sub-millimeter Scale Self-Assembling Robots" (5:50pm - 6:10pm)
[Shuhei Miyashita](#), Maurice Goldi, Christof Audretsch, Rudolf Fuchselin, and [Prof. Rolf Pfeifer](#), Artificial Intelligence Laboratory, University of Zurich, Switzerland
- "Developing Self-Organizing Robotic Cells using Organic Computing Principles" (6:10pm - 6:30pm)
[Alwin Hoffmann](#), Florian Nafz, Hella Seebach, Andreas Schierl, and Wolfgang Reif, University of Augsburg, Germany
- Workshop panel discussions and wrap up. (6:30pm - 7:00pm)

Organizers

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Aim and Scope

Self-organizing robotic systems are supposed to be able to accomplish complex tasks in a changing environment through local interactions among individual simple robots without an external global control. In addition, self-organizing robotic systems should also exhibit other life-like features such as robustness and self-repair. However, design of distributed self-organizing robotic systems is one of the most challenging tasks in robotics.

Biological systems, from macroscopic swarm systems of social insects to microscopic cellular systems, can generate robust and complex emerging global behaviors through relatively simple local interactions in the presence of various kinds of uncertainty. Borrowing ideas from biological systems for developing self-organizing robotic systems has become increasingly popular in recent years. For example, swarm intelligence, a novel paradigm for solving complex problems with massively parallel systems, has been inspired by behaviors observed in social insect colonies and flocks of birds. Another self-organizing process in biology is morphogenesis of multi-cellular organisms. Morphogenetic approaches based on computational models of embryogeny to self-organizing robotic systems have shown to be very promising.

This half-day workshop aims to bring together new theories and methodologies inspired by biological principles for self-organizing robotic systems. The emphasis of the workshop is on bridging multi-disciplinary research areas such as robotics, artificial life, systems biology, and evolutionary computation. Topics of this workshop include, but are not limited to:

- Morphogenetic approaches to self-organizing multi-robot systems
- Morphogenetic approaches to modular robots
- Evolutionary and developmental approaches to design of robot body-plan and controller
- Self-organized multi-robot pattern formation and boundary coverage
- Stigmergy in self-organized collective construction
- Swarm intelligence based approaches to multi-robot systems
- Unified approaches to self-assembling swarm and modular robots
- Evolutionary multi-robot organism
- Robustness, self-reparability and evolvability of self-organizing multi-robot systems

Important Dates:

- Submission deadline: March 1, 2010
- Author notice: March 5, 2010
- Final version due: March 10, 2010
- Workshop date: May 3, 2010

Paper Submission:

Submitted papers should follow the guidance given on the IEEE International Conference on Robotics and Automation (<http://icra2010.grasp.upenn.edu/>). Six pages in the standard ICRA format are allowed for each paper. A maximum of two additional pages is permitted. Prospective authors should submit their contributions electronically in PDF format to the address yan.meng@stevens.edu.

Post Conference Publication:

Depending on the quality of the submissions, authors will be asked to submit an extended version of your article to our approved post-workshop book "Bio-Inspired Self-Organizing Robotic Systems" in Springer book series of "Studies in Computational Intelligence".