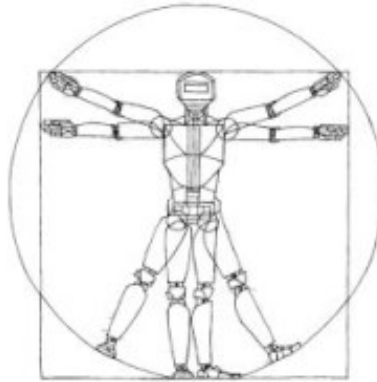**Robotics:  Science & Systems Workshop on**

# Self-Reconfigurable Modular Robots

# Call for Papers



The organizers invite you to submit an extended abstract for review to the RSS 2006 Workshop on Self-Reconfigurable Modular Robots.  The workshop will take place on Saturday, August 19th at the University of Pennsylvania in Philadelphia, Pennsylvania, USA. After the workshop authors will be invited to submit journal length papers for a special issue of the International Journal of Robotics Research (IJRR) on Self-Reconfigurable Modular Robots.

## Important Dates:

- submission deadline for extended abstracts:  June 22nd, 2006
- notification of abstract acceptance:  July 5th, 2006
- workshop:  August 19th, 2006
- submission deadline for full journal paper:  October 30th, 2006
- notification of paper acceptance:  January 31st, 2007
- publication of special issue:  early Fall 2007

## Description

Self-reconfigurable modular robots are metamorphic systems that can autonomously change their logical or physical configurations (such as shapes, sizes, or formations), as well as their locomotion and manipulation capabilities based on the mission and the environment at hand.  Because of their modularity, versatility, self-healing ability and low cost reproducibility, such robots provide a flexible approach for achieving complex tasks in unstructured and dynamic environments.  They are well suited for applications such as search and rescue, reconnaissance, self-assembly, inspections in hazardous environments, and exploration in space and oceans. They also pose fundamental research challenges for robotics and other major branches of computer science, mechatronics and control theory.

This workshop will discuss the grand challenges for self-reconfigurable modular robots and possible approaches to tackle these challenges. These challenges can be organized into the following partially overlapping themes:

**Self-repair and self-replication:** modular robots have the unique capability to recover from damage and replicate structures. One of the biggest challenges is to create practical algorithms that take advantage of this capability.

**Limited resources:** modular robots are limited by power, size, torque and other resources. One of the main challenges here is to improve battery density and fuel storage for modules.

**Scale:** algorithmic and physical limitations make it difficult to scale to a large number of modules and to very small modules. Reliability also becomes an important issue as the number of modules increases or the size decreases. We can define milestones along these scales, such as:

- Build a self-reconfigurable machine with >100 modules
- Build a self-reconfigurable machine with <1cm modules
- Build a machine that can operate unattended for X days or recover from Y% damage
- Develop planning algorithm that will work on >1E6 units in real time (assuming realistic physical, computational, and communication capacity of modules)

**Hardware:** the planning and control side of self-reconfigurable modular robots are far ahead of the hardware side, despite many brilliant and novel ideas. We will address the general hardware issues (including power, connectors, structural strength) that will lead to real and compelling applications.

## Submission

All accepted work will be published in a citable digital archive of the proceedings. After the workshop authors will be invited to submit journal length papers for a special issue of the International Journal of Robotics Research (IJRR) on Self-Reconfigurable Modular Robots.

All submissions should be in PDF format and should be between 1 and 2 pages. Submissions should be emailed to RSS06@markmoll.net by June 22nd. Notification of acceptance will be given by July 3rd.

## Contact

General questions can be sent to RSS06@markmoll.net. More information will be made available on the web at http://www.isi.edu/~moll/RSS06.

## Organizers

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