

***Autonomous Robots* - Special Issue Call for Papers**

Whole-body control of contacts and dynamics for humanoid robots

Guest Editors:

Serena Ivaldi (serena.ivaldi@isir.upmc.fr) – ISIR, CNRS & University Pierre Marie Curie

Jan Babic (jan.babic@ijs.si) – Jozef Stefan Institute

Michael Mistry (m.n.mistry@bham.ac.uk) – University of Birmingham

Robin Murphy (murphy@cse.tamu.edu) – Texas A&M University

The *Autonomous Robots* journal invites papers for a special issue entitled "*Whole-body control of contacts and dynamics for humanoid robots.*" To act in unstructured natural environments as humans do, contacts and physical interactions are necessary and unavoidable. In recent years, whole-body control techniques have matured to the point where various humanoid robots can robustly interact with their environment. Robots may exploit predictable contacts to aid in goal achievement, as well as learn dynamics of contact to generalize over novel tasks and domains. They may regulate their compliance to cope with unpredictable contacts and ensure safe behaviors. While these achievements are a major milestone for robotics, they still need to be applied to more challenging situations, inspired by natural settings and physical interaction scenarios. There is a strong need for advanced methods that can handle multiple contacts, unforeseen or intentional, with different rigidity properties, and guarantee the robust, autonomous execution of actions (balancing, walking, manipulation) in variable contexts.

This special issue focuses on control and learning techniques applied to estimation, control and adaptation of whole-body dynamics movement and contacts forces that go beyond basic balancing abilities. We invite submissions of research papers that address important challenges in robot control of multiple contacts under uncertainty, encouraging discussion of real-world architectural frameworks. We also solicit submissions that rigorously discuss and compare current state of the art techniques, as well as recent advances in the field, or open challenges. Topics of interest include but are not limited to:

- What is the state-of-the-art in whole-body dynamics estimation?
- What is the state of the art in dynamics and contacts simulation?
- How much can we reliably learn from simulations? How can we validate simulations?
- How can modern techniques benefit from studies in human motor control?
- How can we build robots that facilitate balancing on uneven or compliant terrains?
- How can we generalize efficient control techniques to deal with contacts of different nature and properties?
- How can we benefit from recent results in machine learning, e.g., structured learning, Gaussian processes, conditional random fields, deep belief networks?
- How can robots make use of reinforcement learning, or other self-improvement methods, to adapt to changing environments and control tasks?
- How can robots learn to handle compliant contacts?
- Which representations can leverage the acquisition of complete multi-modal models of the environment through physical exploration?
- How can robots determine optimal actions on non-rigid objects?
- How can robots exploit contacts to achieve goal-oriented actions?
- Which sets of sensors can be used to estimate the physical interaction of the robot with its environment?
- How can robots exploit physical forces from interaction with humans?
- How can robots learn to detect and exploit the salient events in human whole-body tasks, e.g. when humans make and break contact?
- How can human task knowledge be efficiently transferred to robots?
- What are the key challenges and can we decide on benchmark tasks that allow us to measure and compare progress in this field?
- What are new metrics and practical methods for evaluating platform, software, human-robot interaction, and overall system performance in the field?

For more information, contact: serena.ivaldi@isir.upmc.fr

Important Dates

- Paper submission deadline: August 15th, 2014
- First reviews completed: November 15th, 2014
- Revised papers due: December 15th, 2014
- Final decision: December 30th, 2014