

ICRA 2011 Workshop

Scientific collaboration in Embodied Intelligence in Europe *The FET EMBODYi programme of the European Commission and the new actions for 2011-2012 (Flagships and FP8)*

Shanghai, China, May 13, 9.00 – 17.00

Embodied Intelligence is one of the current challenges of robotics research. Taking into account the morphology of the body and the mechanical properties of the materials in robot design can highly simplify control and computation. The FET EMBODYi of the European Commission is one of the Proactive Initiative of the FET programme, focused on Future and Emerging Technologies and aimed at supporting high-risk visionary interdisciplinary projects at the confluence of ICT and science. The FET programme has launched a call, in 2008, for projects investigating the concept of Embodied Intelligence and developing new technologies and design approaches for building physically embodied intelligent agents and artefacts, with emphasis on the relationship between shape, function and the physical and social environment. Such projects address diverse aspects of Embodied Intelligence, like:

- mind-body co-development and co-evolution through permanent and extended multimodal interaction of agents with the physical and social environment;
- morphology and behaviour: new design principles for sensing, actuation and locomotion components and for robot architectures that are based on a deeper understanding of the role of form and material properties in shaping behaviour, and of the ways in which these afford relationships and interactions with the environment and with other agents;
- design for emergence: design paradigms and techniques for purposive agents where behaviour is not strictly programmed but robustly emerges from the interaction of the various components (each with local intelligence), the environment and its ubiquitous information resources.

The EMBODYi programme then funded 6 projects that started in 2009 and are now at their first achievements in terms of prototypes. The proposed workshop aims at presenting and discussing their current research and results, in the wider robotics community. The 6 FET EMBODYi projects operate independently but with common joint initiatives. The main topic addressed by EMBODYi is Embodied Intelligence, in diverse interpretations and implementations:

- OCTOPUS: Novel Design Principles and Technologies for a New Generation of High Dexterity Soft-bodied Robots Inspired by the Morphology and Behaviour of the Octopus
- LOCOMORPH: Locomotion and movement in robots, with enhanced manoeuvrability, self-stabilization, energy efficiency and adaptation, thanks to morphology and morphosis
- ANGELS: Anguilliform swimming robot with a bio-inspired electrical sense
- EVRYON: Wearable robots for functional restoration, substitution, rehabilitation, augmentation
- E-MORPH: Biologically-inspired visual sensor
- VIATORS: Safe, energy-efficient and highly dynamic variable impedance actuators

As a whole, the 6 EMBODYi project represent a significant coordinated effort in Europe, with a potential critical mass. It is important that such activities are presented to a wider robotics community and that a discussion is held by researchers in this field, to share vision, challenges, approaches, and solutions.

The workshop also aims at giving the perspectives of this line of research in Europe, by outlining the new scientific challenges of the European Commission with the revolutionary initiative of the European Flagships.

The workshop targets researchers and scientists addressing Embodied Intelligence in their studies. The audience is not limited to robotics researchers but it is open to the many disciplines related to Embodied Intelligence, non only in the ICT domain, like artificial intelligence, control, sensors, actuators, computing, but also in the biological field.

Students would also benefit from attending this workshop for having a direct interaction with the main scientists working in this emerging field and a first-hand knowledge of the collaboration among different countries and different disciplines in the EMBODYi projects.

Organizers

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Workshop program

9:00 - 9:10	Introduction to the Workshop	Cecilia Laschi	Scuola Superiore Sant'Anna, Pisa, Italy	OCTOPUS
9:10 - 9:30	The FET EMBODYi initiative	Jianwei Zhang	University of Hamburg, Germany, on behalf of the European Commission, Information Society & Media Directorate General - INFSO	
The interpretation of Embodied Intelligence in the 6 EMBODYi projects				
<i>Embodied Intelligence in robots inspired by animals: manipulating like an octopus, sensing like a fish</i>				
9:30 - 10:00	The OCTOPUS Integrating Project	Cecilia Laschi	Scuola Superiore Sant'Anna, Pisa, Italy	OCTOPUS
10:00 - 10:40	The ANGELS Project: "A nice illustration of the embodiment concept in ANGELS: Electric line tracking based navigation"	Frederic Boyer	Ecole des Mines, Nantes, France	ANGELS
10:40 - 11:00	<i>COFFEE-BREAK</i>			
<i>Embodied Intelligence in wearable robots for assistance and rehabilitation</i>				
11:00 - 11:30	The EVRYON Project: Towards a Design Methodology for Robots with Embodied Intelligence	Dino Accoto	University Campus Bio-Medico, Rome, Italy	EVRYON
<i>Embodied Intelligence in robot components: biomimetic vision and intrinsically compliant actuators</i>				
11:30 - 12:00	The E-MORPH Project	Giorgio Metta	Istituto Italiano di Tecnologia, Genova, Italy	E-MORPH
12:00 - 14:00	<i>LUNCH BREAK</i>			
14:00 - 14:30	The VIACTORS Project	Alin Albu-Schaeffer	DLR/Institute of Robotics and Mechatronics, Wessling, Germany	VIACTORS
Horizontal views and perspectives of Embodied Intelligence				
14:30 - 15:00	Beyond animal models: embodied intelligence in plant roots	Barbara Mazzolai	Center for Micro-BioRobotics IIT@SSSA, Italy	OCTOPUS
15:00 - 15:30	"Soft Robotics": Self-organization, embodiment, and biological inspiration	Rolf Pfeifer	University of Zurich, Switzerland	OCTOPUS, LOCOMORPH
15:30 - 16:00	<i>COFFEE-BREAK</i>			
16:00 - 16:45	The revolutionary EC initiative of FET Flagships and the future FET Flagship "Robot Companions for Citizens"	Paolo Dario	Scuola Superiore Sant'Anna, Pisa, Italy	OCTOPUS, ANGELS
16:45 - 17:00	Final discussion	Audience and Speakers		