The Hand Embodied

Fact Sheet

Project Information

THE

Grant agreement ID: 248587

Funded under
FP7-ICT

Overall budget
€ 9 576 461

EU contribution
€ 7 175 692

Coordinated by
UNIVERSITA DI PISA

Italy

Start date
1 March 2010

End date
31 May 2014

Project description

Cognitive Systems and Robotics
Advancing the state of the art in artificial system architectures for the "hand" as a cognitive organ
The scientific goals of The Hand Embodied concern the reciprocal linkages between the physical hand and its high-level control functions, and about the way that the embodiment enables and determines its behaviours and cognitive functions. The idea is to study how the embodied characteristics of the human hand affect and determine the learning and control strategies people use for such fundamental cognitive functions as exploring, grasping and manipulating. The ultimate goal of the project is to learn from human data how to devise improved
system architectures for the hand as a cognitive organ, and eventually how to better design and control robot hands, haptic interfaces and hand prostheses.

The scientific goals of the proposal revolve around the reciprocal linkages between the physical hand and its high-level control functions, and about the way that the embodiment enables and determines its behaviours and cognitive functions. THE Hand Embodied refers to the hand as both a cognitive entity standing for the sense of active touch and as the physical embodiment of such sense, the organ, comprised of actuators and sensors that ultimately realize the link between perception and action. The study of the intrinsic relationship between the hand as a cognitive abstraction and its bodily instance will be made possible by: (a) performing neuroscientific and perceptual behavioural studies with participants engaged in controlled manual activities; and (b) the parallel development of a theoretical framework to lay the foundations for design and control of robotic hands and haptic interfaces. The general idea is to study how the embodied characteristics of the human hand and its sensors, the sensorimotor transformations, and the very constraints they impose, affect and determine the learning and control strategies we use for such fundamental cognitive functions as exploring, grasping and manipulating. The ultimate goal of the present proposal is to learn from human data and hypotheses-driven simulations how to devise improved system architectures for the hand as a cognitive organ, and eventually how to better design and control robot hands and haptic interfaces. The project hinges about the conceptual structure and the geometry of such enabling constraints, or synergies: correlations in redundant hand mobility (motor synergies), correlations in redundant cutaneous and kinaesthetic receptors readings (multi-cue integration), and overall sensorimotor system synergies. These are also our key ideas for advancing the state of the art in artificial systems for robotic manipulation and haptic and neuroprosthetic interfaces.

Fields of science

Programme(s)

Topic(s)

Call for proposal
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<th>Coordinator</th>
<th>Activity type</th>
<th>EU contribution</th>
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<td>UNIVERSITA DI PISA</td>
<td>Higher or Secondary Education Establishments</td>
<td>€ 1 600 583</td>
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<td>MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTEN EV</td>
<td>Research Organisations</td>
<td>€ 129 906</td>
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<td>UNIVERSITAET BIELEFELD</td>
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