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Editorial

Cognitive robotics: Introduction to the special issue

1. Overview

Much research in the cognitive sciences, including psychology, in the last two decades has shifted from the traditional cognitivist view of cognition as the internal, computational manipulation of representations of the outside world to a much more interactive view of cognition as embodied, situated and/or distributed activity, emergent from the interaction of brain, body and environment (material and social).

Naturally, this development has also led to changes in how cognition is modeled. While the traditional artificial intelligence approach was first and foremost concerned with computer programs, recent research is increasingly focused on real and simulated robotic systems whose cognitive processes need to be grounded in sensorimotor interaction with the environment they are situated in. The papers included in this special issue on cognitive robotics reflect different approaches to and different aspects of this type of research, and discuss its relevance to theoretical psychology and cognitive science in general.

The paper by Hardy-Vallée discusses, from a philosophical perspective, the case of decision-making in artificial and natural agents and how work in robotics helps to elucidate the embodied and situated nature of decisions.

D'Mello and Franklin in their position paper provide a general discussion of the mutual benefits to be gained from closer interaction between computational/robotic modeling and experimental psychology.

In a similar vein, Kelley and Cassenti in their contribution discuss possible synergies between cognitive robotics and developmental psychology, and illustrate their discussion by mapping Zelazo's levels of consciousness onto an existing computational cognitive architecture.

The paper by Schenck and colleagues provides a very detailed case study of a concrete computational model implemented in a grasping robot, which is directly based on Rizzolatti's premotor theory of attention.

Dominey and Warneken in their paper provide case studies of shared intentionality in human–robot interaction, bringing together research in computational neuroscience, robotics and not least developmental psychology.

The contribution by Pezzulo and Calvi addresses methodological issues in studying embodied and situated cognition in simulations and exemplifies the discussion with a focus on Barsalou's perceptual symbol systems framework.

The paper by Mirolli and Parisi points out that much work in cognitive robotics so far has addressed relatively low-level cognition only, and the authors take a Vygotskyan perspective on how this research can be extended to include language.

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The last paper by Morse and colleagues, finally, relates current work in cognitive robotics back to the arguments of Allen Newell, one of the founders of the computational cognitive modeling approach, and argues that cognitive robotics is a challenging testbed for the theoretical cumulation and integration that Newell was striving for.

Tom Ziemke*
Cognition & Interaction Lab, School of Humanities & Informatics,
University of Skövde, Box 408, 54128 Skövde, Sweden
* Corresponding author.
E-mail address: tom.ziemke@his.se

Mark Bickhard
Department of Philosophy, Lehigh University,
15 University Drive, Bethlehem, PA 18015, USA
E-mail address: mhb0@lehigh.edu