Call for Papers
Special Issue on

Behavior and Mind as a Complex Adaptive System

Adaptive Behavior Journal

(http://www.sagepub.co.uk/journal.aspx?pid=105464)

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Recent advances in cognitive science (Varela et al., 1991; Brooks, 1991; Beer, 1995; Chiel and Beer, 1997; Clark, 1997; Tani, 1998; Pfeifer and Scheier, 1999; Nolfi and Floreano, 2000; Nolfi 2005) have clarified that intelligence resides in the circular relationship between the brain of an individual organism, its body, and the environment. More precisely, behavior is (a) a phenomenon resulting from fast non-linear interactions between the brain of an organism, its body, and the environment (Chiel and Beer, 1997), and (b) a multiple-scaled phenomenon with different levels of organization in which properties at different levels extend at different time–space scales and both affect and are affected by lower- and higher-level properties (Keijzer, 2001; Paine & Tani, 2005; Nolfi, 2005). This implies that behavior is an emergent property, that is, a property that cannot be inferred by an external observer, even on the basis of a complete description of the elements involved in the interactions and of the rules governing the interaction.

The emergent nature of behavior has fundamental implications for the practical engineering of artificial behavioral systems. Classical approaches based on explicit design, in fact, are hopeless, because they require the identification of elements and interaction rules (at a micro level) that will lead to the desired behavior (at a macro level) as a result of the interaction occurring at different levels of organization and at different time scales and involving not only the elementary elements (i.e., the brain of individual, its body, and the environment) but also the behavioral properties emerging from the interactions. A promising alternative approach consists of self-organizing methods based on evolutionary and/or learning algorithms in which (a) the free parameters encode the rules that regulate the interactions at the micro level, and (b) variations of the free parameters are retained or discarded on the basis of their effect at the macro (behavioral) level (Nolfi, 2005). These approaches, in fact, allow us to discover and capitalize on properties emerging from the interactions without the need to identify the relationship between these properties and the interactions that give rise to them. In general terms, this means that behavioral systems are intrinsically adaptive systems.

The objective of this special issue is to rethink the concepts of space and time in simulated agents/vehicles with reference to agent/environment relationships. In addition, we will discuss how the challenges of higher-order cognition, including anticipation, mental simulations, and motor planning can be incorporated into the approach of behavior-based complex adaptive systems. As a result, we will inevitably refer to some phenomenological problems of consciousness and qualia (Tani, 1998; Iizuka and Ikegami, 2004).

Submissions should represent a theoretical and experimental contribution to this objective in the context of embodied autonomous agents. More specifically, we welcome papers that address the following (among others) topics:

- Emergence and adaptation
- Behavior as a multi-layered property
- The role of processes that occur at different time scales and properties that extend for different time spans
- Representation, mental processes, and behavior
- Sensorimotor coordination as a property emerging from agent/body/environment interaction
- Social behavior as a property emerging from agents' interactions

Submission instructions

All manuscripts should be e-mailed to the guest editor (Stefano Nolfi, stefano.nolfi@istc.cnr.it) by March 31, 2007. Papers in this special issue should not exceed the equivalent length of 14 journal pages. See the website of the *Adaptive Behavior* journal (http://www.isab.org.uk/journal/) for further instructions. If you intend to submit a paper, please send a tentative title and abstract to the guest editors. (This will help speed up the selection of reviewers.) If you are uncertain whether your paper pertains to the topic of this special issue, or if you wish further information, please contact the guest editors.

Important dates

Deadline for paper submission: **April 30, 2007**
Notification of acceptance: **June 30, 2007**
Final manuscript due: **September 30, 2007**
Expected Publication date**: February-March 2008**

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