Representation of Reality: Humans, Animals and Machines

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INTRODUCTION

Our symposium could be considered as the continuation of a part of the symposium "Computing Nature" organized by Gordana Dodig – Crnkovic and Raffaela Giovagnoli in the AISB/IACAP World Congress 2012. We would like to offer an occasion to discuss the problem of "representation" in humans, other animals and machines. It is closely related to the question what capacities can be plausibly computed and what are the most promising approaches that try to solve the problem. We asked for contributions focused on three main topics:

(1) The point of view of connectionism and dynamical systems (Scheutz, Clark, Juarrero, Kaneko and Tsuda, O'Brien, Horgan, Trenholme) namely the different proposals about the possibility to rule out representation.

(2) A plausible strategy to analyze the problem of representation from a philosophical perspective that implies the comparison between human and machine capacities and skills. For machine representation current results in AI and cognitive robotics are of interest.

(3) Evolutionary aspects of the development of increasingly complex capacities in (embodied, embedded) living organisms to process information in the interaction with the environment and as a consequence develop new morphological structures – morphogenesis, meta-morphogenesis.

Basti's paper offers and interesting research about the nature of human brains as cognitive agents. The starting point is to recall in which sense Quantum Field Theory constitutes a new paradigms in fundamental physics as irreducible to Quantum Mechanics. Reality could be construed through info-computation (Dodig-Crnkovic). But, how reality of a bacterium differs from a reality of a human brain? To solve this problem Dodig-Crnkovic uses the results of information integration and representation. Zarebsky describess a fruitful comparison between human and machines representational constrains. He focuses on Information Systems Ontologies (ISO) and its relation with the representational constrains of human cognition. Nath explores the idea of machine consciousness as causally dependent on the material universe so that all consciousness phenomena can be explained by mapping the physical universe. This mechanical/epistemological view cannot but avoid metaphysical implication of consciousness.

A challenge for the classical notion of representation is presented by the so called "morphological computation". Müller offers a critical analysis of this strategy that aims at explaining intelligent abilities of natural agents through reference to their bodily structure and at using this morphology for the engineering of intelligent abilities in artificial agents. Lanfredini's contribution seems to present a philosophical background for morphological computation. But, she concentrates on an ontological perspective of mind according to which it is inherently embodied with the primacy of action over representation.

Along the line of the classical dispute about the Turing test introduced by Searle, Zenil proposes some plausible ideas about intelligence and consciousness that ground an approach of computation that turns to be observer dependent. The contribution of Petters, Hummel, Jüttner, Wakui and Davidoff is centered on recent experimental studies about the development towards adult performance levels in configural processing in object recognition. They use JIM3 artificial neural networks and present interesting results on representation in humans, animals and machines. The paper by Giovagnoli focuses on the role of language in representation. Language bridges the gap between humans and machines because it is the means to build ontologies. Representation of knowledge is the center of important researches in the field of Sematic Web.