ANALYSIS OF THE DESIGN OF A FRAMEWORK SUPPORTING MEANING PROCESSES IN LIVING AND ARTIFICIAL SYSTEMS

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ABSTRACT

Cognitive theories explaining how intelligent behaviour and action is produced have been the basis for designing and implementing intelligent artificial systems. Although it is widely accepted that the notion of autonomous intelligent action consists of at least the concepts of intentionality, representation, meaning and information (Collier, 1999), it seems that their interrelations as well as their functional activation outside or inside the system, result in different theories of cognition and interaction. The problem is usually concentrated on the necessity (*the hard version – are they necessary or not?*) of the usage of representations in explaining and producing cognition, or, in the softer and more interesting aspect of the debate, on the objection of a hard, explicit and static notion of representation instead of a more implicit and dynamic one. The different use of the concept of representation results in different frameworks analysing and modeling cognition, where intentionality, meaning and information adopt a different functional and explanatory role.

So far, the respective dominant paradigms are the classical cognitivist (Fodor, 1975)**,** (Newell, 1980) and connectionist (Smolensky, 1988), the etiologically evolutionary (Milikan, 1984), (Dretske, 1988) and the dynamic (van Gelder, 1998). They are all characterized by inherent limitations such as their inability to account for both low and high-level cognition or to scale between them (the symbol-grounding problem and the frame problem) (Harnad, 1990, 2001) (Harnad, 1993) and they all phase a fundamental problem of not being able to account for the emergence of representation in a purely naturalistic manner, as well as their falsification and many other related issues (Bickhard, 1993, 2001), (Christensen, 2004).

This paper proposes a systems-theoretic framework which seems to move towards the accommodation of the aforementioned difficulties, while preserving the basic notions of cognition by incorporating them in an anticipative and interactive context of information dynamics.
The proposed framework utilises elements from Brier's cybersemiotic model (Brier, 2001) and tries to support the reconstruction of the basic cognitive concepts (intentionality, representation, meaning and information) in a dynamical, situated and evolutionary context. Specifically, the 2nd –order cybernetics and self-organisation properties are used in the proposed framework to account for a complex and emergent relational structure of representations, and furthermore, their closure and embodied-based functionality provide the basis for the use of Peircian semiotic process (Peirce, 1998) as the vehicle of these representations and their content formation.

This approach is not a hybrid dynamic/symbolic one, but an interplay between analogue and digital representational content, in an attempt to model the intentional

behavior of a system by the internal incorporation of its constraints in its actions. The focus on the explicitly referential covariation of information between internal (system) and external (environment) states is shifted towards the interactive modulation of implicit internal content and therefore, the resulting semantic adaptation of the system via its interaction with the environment. The basic components of the framework and their dynamic relations are analysed. The result of the analysis suggests that this framework is a hopeful solution towards the emergence of meaning structures in humans and machines.

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