Exploring the limits of situated and dynamical cognition: embedded vs. extended cognition

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Abstract

In 1998 Andy Clark and David Chalmers published an article on the so called *The Extended Mind Thesis* [1]. Their main claim was as innovative as provocative: they claimed that given the right conditions, **our minds extend through the World in such a way that allows us to affirm that the thinking subject is not delimited by his head.**

Is this new approach to cognition justified or not? In search for the limits of this –claimed to be– new approach, we want to focus on the differences that there might exist between embedded and extended cognition. Why do not we consider the embedded approach enough?

Extended vs. Embedded

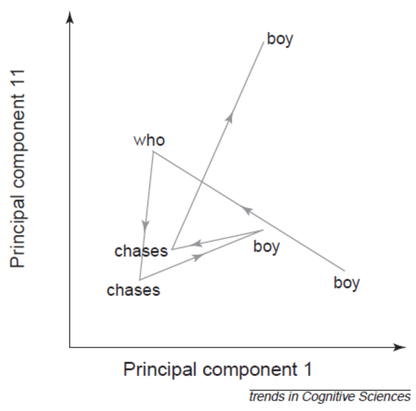
Where the limits of cognitive science are? What kind of relation do we need to explain it: a causal one or a constitutive one? Whether we chose the first or the second options we will be supporting embedded or extended cognition respectively.

Strengths of the Dynamical approach

The dynamic framework to the study of cognition has profound empirical consequences on the practice of cognitive science. Here, we present a review of three contrasting examples of work in this area [2] in order to deepen in our insights about the reach of the situated approaches to cognition.

Structure of language [3]

Elman's connectionist approach to language involves simple recurrent networks

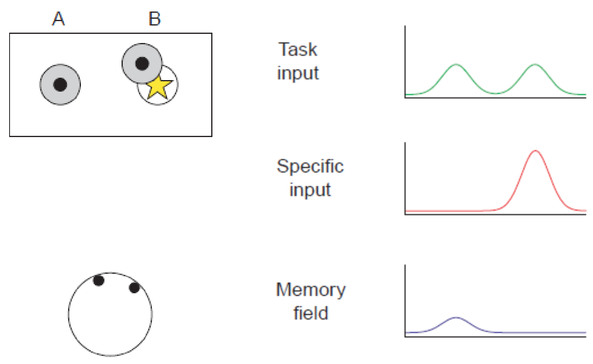


The network had developed an internal dynamics whose organization reflected grammatical category and meaning a networks state did not have a one-to-one correspondence with words, but rather to the outcome of processing a word within a particular context.

The A-not-B error [4]

A dynamical model of Piaget's classic 'A-not-B' error in infants was developed using a general dynamical theory of motor programming.

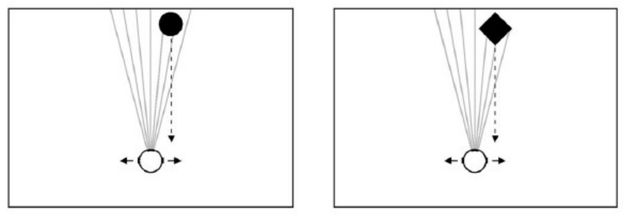
The dynamical model presented is based on a one-dimensional field



The success in the experiment This suggests that the ability of the planning field to generate self-sustained activity might be an important developmental parameter.

Categorical perception [5]

This example uses an evolutionary approach to design of a dynamic neural network applied to the study of a 'minimally cognitive behavior', concretely to the task of visually discriminate between two classes of objects of the same size, catching circles and avoiding diamonds.



Analyzing the movement of the resulting agent, is noted how the subtle interplay between sensory input and internal state is crucial to accurate discrimination.

Conclusions

Why do we need more assumptions than a dynamical framework? In a nutshell: we hold that with a **deeper analysis of the features of the dynamical approach**, we could find the most adequate candidate for the proper study of the mind in a post-cognitivism scenario, allowing us to generate: (1) new ideas and concepts for exploring the relations between matter and mind, (2) new tools and models, to generate novel notions able to exercise our scientific mind in understanding complex embodied and embedded systems

References

[1] Clark and Chalmers (1998). The Extended Mind

[2] Beer (2000). Dynamical approaches to cognitive science

[3] Elman (1995) Language as a dynamical system

[4] Thelen and al. (2001). The dynamics of embodiment

[5] Beer (2003). The dynamics of active categorical perception in an evolved model agent