Computation Matters: An Analog View of Vision

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Introduction

My purpose for this paper is to show that although the brain *is* a computational device, naturalistic explanations of its processing do *not* require a strong commitment to internal representations. Aside from resolving questions of ontology, the following consideration motivates this project: providing a plausible computational framework from which to mechanisticly explain how the mind/brain works, yet that is consistent with a situated action approach to cognition. The type of cognitive processing of concern here is vision.

Computationalism

Computationalism is the view that a computational framework is essential to explain the workings of intelligent systems. Notwithstanding the widespread notion of synonymy between 'computation' and 'symbolic-digital computation', ignoring hybrids, there are two computational paradigms: symbolic, digital, rule-following, discrete processing [*classicist computation*] and nonsymbolic, analog, rule-governed, continuous processing [*connectionist PDP-style computation*].

A "computational system" is a system/device whose behavior can be interpreted as satisfying some function (Churchland & Sejnowski, 1992). Since every system implements some function, the mind/brain, unsurprisingly, is a computational system.

Since internal representations are said to figure in both types of computational processing, is the status of internal representations in explanations of the mind/brain assured? No. Although symbolic-digital computation requires a medium of internal representations, I provide conceptual and empirical reasons for thinking that brains are not classicist devices. For example, the brain does not [and need not] maintain a 3-D representation that corresponds detail-by-detail to the extra-mental world, for the "world itself is highly stable and conveniently 'out there' to be sampled and resampled" (Churchland, Ramachandran & Sejnowski, 1994, p. 36; Douglas, Mahowald & Mead, 1995; Van Essen & Anderson, 1994). In addition, the nonmodular organization of the brain and the unencapsulated flow of visual information also clash with the symbolic-digital view (Knudsen & Brainard, 1995; Van Essen, Anderson & Olshausen, 1994).

The nonsymbolic-analog view of vision

I argue that brains are *nonsymbolic-analog* computational devices. Drawing upon my analysis in (Stufflebeam, 1995) regarding the individuation of representations and the role and status of 'distributed representations' in explanations of PDP, I argue that distributed patterns of activation are not "internal" representations. Rather, they are extrinsic ones: among other failings, their status as representations depends on the [mere] act of interpretation/description. Though a computational framework demands a "medium" for the input-to-output transformations, I show that computational descriptions neither license nor require a [strong] commitment to internal representations (cf. Fodor, 1975). And if this nonsymbolic-analog approach to vision scales up to a scientific understanding of higher-order cognition, then the need for internal representations in explanations of cognitive processing is minimal.

References

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