

## **Classic Papers: Review/Analysis**

### **Title and Author:**

**Title:** Embodied Cognition: A field guide

**Author:** Michael L. Anderson

### **Hook:**

This classic paper by Anderson provides a solid case for Embodied Cognition and its relevance within the realm of cognitive science. They controversially discuss that we should be moving away from the Cartesian, cognitivist theory of cognition and instead embrace EC as something that can help us better understand our brains and minds.

## **Knowledge Relating to the Cognitive Science Program Learning Outcomes**

1. Consciousness and Controversies
  - a. However, the most immediate point is fairly straightforward: the content and relations of concepts—that is, the structure of our conceptual schema—is primarily determined by practical criteria, rather than abstract or logical ones. Likewise, experience, which after all consists of ongoing inputs from many different sources, is unified into a single object of consciousness by, and in terms of, our practical orientation to the world: “the subject which controls the integration or synthesis of the contents of experience is not a detached spectator consciousness, an ‘I think that’, but rather the body-subject in its ongoing active engagement with [the world]”
2. Symbol Systems
  - a. While it is true that the original notion of a ‘symbol’—as proposed in the physical symbol systems hypothesis [7,85,86]—was quite broad, given the distinctions

suggested above, the decision to restrict the use of ‘representation’ to a smaller sub-set of inner states seems reasonable and motivated, and has the added virtue of conforming to common AI practice (as illustrated in the central hypothesis of GOFAI, Section 1). Hayes et al. may have good reasons for continuing to advocate a broader usage, but if so those reasons are not evident here, and the reader is left wondering if its main virtue is allowing the authors to accept the central claims of SC without appearing to have shifted ground.

### 3. Language and Culture

- a. Clark [20] notes that we do very complex things, e.g., building a jumbo jet or running a country “only indirectly—by creating larger external structures, both physical and social, which can then prompt and coordinate a long sequence of individually tractable episodes of problem solving, preserving and transmitting partial solutions along the way” (p. 186). These structures include language, especially written language, and indeed all physically instantiated representations or cognitive aids, such as maps, road signs, and the arrangement and labeling of supermarket aisles. Such scaffolds allow us to break down a complex problem into a series of small, easy ones, as when we write down intermediate results in long division, or memorize only as many abstract spatial directions as we know are necessary to get us to where we can employ the simpler strategy of following the road signs to downtown.

### 4. Darwinian Processes and Evolution

- a. In contrast to this high-level or top-down approach to intelligence, Brooks advocates studying intelligence from the bottom up, and specifically urges us to recall our evolutionary lineage. As evolved creatures, human beings are largely continuous with our forebears, and we have inherited from them a substrate of capacities and systems for meeting our needs in, and generally coping with a

given environment... As we will see, this tendency to emphasize, on evolutionary grounds, the continuity between humans and other animals, and the converse willingness to see in animals instances of intelligent behavior, is an extremely important motivation for the study of EC.

## 5. Embodiment, Emergence, and Distributed Cognition

- a. Against the cognitivist claim that cognition is the rule-based manipulation of abstract representations, EC maintains that there is much more to cognition than mental representation. Cognition exploits repeated interaction with the environment, not only using the world as its own best model, but creating structures which advance and simplify cognitive tasks. The explicit representations cognition does employ are generally limited, physically grounded and oriented toward the specific needs of a given agent.