

10 Salient Sentences from Chapter 4 of Hofstadter's "Fluid Concepts and Creative Analogies"

1) Representations

We may divide representations into two kinds: long-term knowledge representations that are stored passively somewhere in the system, and short-term representations that are active at a given moment in a particular mental or computational process. (P173)

2) The Problem with Most Traditional Applications of AI

"The traditional approach in artificial intelligence has been to start by selecting not only a preferred type of high-level representational structure, but also the data assumed to be relevant to the problem at hand. These data are organized by a human programmer who appropriately fits them into the chosen representational structure. Usually, researchers use their prior knowledge of the nature of the problem to hand-code a representation of the data into a near-optimal form. Only after all this hand-coding is completed is the representation allowed to be manipulated by the machine. The problem of representation-formation, and thus the problem of high-level perception, is ignored." P173

3) The Copycat Program

One of them, the Copycat program (see Chapter 5 as well as Mitchell, 1993), works in a domain of alphabetical letter-strings. This domain is simple enough that the problems of low-level perception are avoided, but complex enough that the main issues in high-level perception arise and can be studied. P190

4) Core Problems of Cognition Modeling

“Low-level perception is far from uninteresting, but it is high-level perception that is most relevant to the central problems of cognition. The study of high-level perception leads us directly to the problem of mental representation. Representations are the fruits of perception. In order for raw data to be shaped into a coherent whole, they must go through a process of filtering and organization, yielding a structured representation that can be used by the mind for any number of purposes.” P170

5) Models of Analogical Thought

Analogical thought further provides one of the clearest illustrations of the flexible nature of our perceptual abilities. Making an analogy requires highlighting various different aspects of a situation, and the aspects that are highlighted are often not the most obvious features. The perception of a situation can change radically, depending on the analogy we are making.

6) Objectivism and traditional AI:

The physical symbol system hypothesis (Newell & Simon, 1976), upon which most of the traditional AI enterprise has been built, posits that thinking occurs through the manipulation of symbolic representations, which are composed of atomic symbolic primitives.

7) Microdomains

While microdomains may superficially seem less impressive than "real world" domains, the fact that they are explicitly idealized worlds allows the issues under study to be thrown into clear relief - something that generally speaking is not possible in a full-scale real-world problem. Once we have some understanding of the way cognitive processes work in restricted domain, we will have made genuine progress towards understanding the same phenomena in the unrestricted real world.

8) Semanticism:

The distinguishing mark of high-level perception is that it is semantic: it involves drawing meaning out of situations. The more semantic the processing involved, the greater the role played by concepts in this processing, and thus the greater the scope for top-down influences. The most abstract of all types of perception, the understanding of complete situations, is also the most flexible

9) Microworlds:

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10) Digital meaning:

The formation of appropriate representations is at the heart of human high level cognitive abilities. It might even be said that the problem of high-level perception forms the central task facing the artificial-intelligence community: the task of how to draw meaning out of the world.