

## Knowledge Representation and Metaphor

Eileen Cornell Way

(State University of New York, Binghamton)

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Eileen Way has written a far-ranging and often fascinating book that argues for the importance of metaphor for theories of knowledge representation and presents her new theory of metaphor, called the Dynamic Type Hierarchy (DTH).

### 1. Outline of the Book

Chapter 1 provides Way's perspective on language and lays the basis for the rest of the book. The first part of Chapter 2 reviews the major philosophical theories of metaphor. Included in this review is the *Interactionist* approach pioneered by Richards (1936) and later refined by Max Black (1962). This approach forms the basis for Way's theory. The latter part of this chapter gives an excellent review of the current psycholinguistic evidence on metaphor.

Chapter 3 surveys a number of AI knowledge representation issues and controversies. Among the many issues touched upon are nonmonotonic logic, the frame problem, neats versus scruffies, semantic nets versus first-order logic, the debate over primitives, and declarative versus procedural representations. In the book's preface, Way indicates that this chapter is intended to be a tutorial for those unfamiliar with AI representation issues. Unfortunately, the unfocused nature of this chapter will probably leave those readers ill-equipped for the specific issues that arise later in the book. The topic of knowledge representation continues in Chapter 4 with a discussion of John Sowa's theory of Conceptual Graphs (Sowa 1984). Way adopts Conceptual Graphs as the representation system for her theory of metaphor. Disconcertingly, Way cites at least three different works by Sowa without including them in the references.

Chapter 5 introduces Way's theory of the Dynamic Type Hierarchy. The basis for this theory is a type hierarchy with multiple inheritance. Metaphor is viewed as a way to highlight and change the structure of the hierarchy. The fundamental idea is that interpreting a metaphor involves an upward search through the hierarchy for a common ancestor of the tenor and vehicle of the metaphor. This search is followed by the *creation* of a new concept more specialized than the common ancestor, which is made the immediate parent of the tenor and vehicle concepts. Notably, these mechanisms are quite similar to those used by Fass to implement his theory of Collative Semantics in the Meta5 system (Fass 1988) and the learning mechanisms in the MIDAS system (Martin 1990).

Chapter 6, entitled "Computational Theories of Metaphor," reviews a number of more modern theories of metaphor and compares them to the DTH approach. The theories presented here are mostly from the field of cognitive science, and are more

formal than those discussed in Chapter 2. Unfortunately, Way fails to discuss any implemented systems designed to interpret or generate metaphor, such as Russell (1976), Wilks (1978), Weiner (1984), Jacobs (1985), Fass (1988, 1991), and Martin (1990).

Chapter 7 presents a discussion of the logical foundations of inheritance hierarchies. Chapter 8 is a broad discussion relating the DTH theory to issues such as prototype theory and Wittgenstein's notions of family resemblance.

The final chapter, entitled "Programming the Dynamic Type Hierarchy," promises to fill in the implementation details missing from Chapter 5. It begins with a detailed description of the CGEN system, a semantic interpreter based on Sowa's theories implemented at IBM. This system does *not* implement the DTH theory and it is never made clear why the details presented here are important to the DTH theory. The remainder of the chapter illustrates how the DTH would behave by running through several illustrative examples. Unfortunately, the lack of an implementation severely limits the effectiveness of this discussion.

## 2. Comments

While this book succeeds in presenting a fresh perspective on some traditional language problems, it fails to make the computational case for the new DTH theory. Much of the book suffers from a lack of clear focus, resulting in too much philosophy and too little implementation and experimentation. As a consequence, the description of the Dynamic Type Hierarchy, while intriguing, is too impoverished to be anything more than suggestive to those interested in actually implementing these ideas.

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