What is Knowledge Representation?
Davis, Shrobe, Szolovits

Summary

This paper is a discussion of the fundamentals of Knowledge Representation, from a somewhat abstract, often philosophical viewpoint.

The most important aspects of this paper are the authors’ descriptions of the five different roles Knowledge Representation (KR) plays:

- A surrogate
  - A substitute for the thing itself
- A set of ontological commitments
  - “In what terms should I think about the world?”
- A fragmentary theory of intelligent reasoning
  - The representation’s fundamental conception of intelligent reasoning
  - The set of inferences the representation sanctions
  - The set of inferences it recommends
- A medium for pragmatically efficient computation
  - The computational environment in which thinking is accomplished
- A medium of human expression
  - A language in which we say things about the world

Rather than summarize the entire paper, as I’m sure everyone has already read it, I’d like to point out a couple of the more interesting points:

- In the discussion of surrogates, it is stated that since no surrogate (substitute for the “real thing”) can be an exact representation of the original, errors must exist in the broadest sets of deductions that can be determined based on that surrogate. Class discussion focused on what this could mean in terms of scientific or mathematical reasoning, as well as more abstract concepts.
- The question “What is intelligent reasoning?” was discussed at some length. Of particular interest is the notion that insights about the nature of intelligent reasoning have come from work in five primary fields: mathematical logic, psychology, biology, statistics, and economics. Discussion ensued concerning the effect biology and economics would have on intelligent reasoning, including the notion of “parallel interconnections of a large collection of very simple processors” (biology), and utility theory (economics).

The authors then present the “Consequences for Research and Practice,” in which they claim that these five roles provide a framework for understanding and developing knowledge representations. They stress that it is important to consider all five roles when developing KR. Emphasis is placed on making sure the correct representation is used for a particular task, rather than trying to fit an existing representation around a task it was not meant to cover.
In conclusion, the authors state that the primary goal of KR research should be to “describe the richness of the world,” rather than simply dealing with “taxonomic and default reasoning.”

**Overall contribution to this class**

The paper does not provide any concrete tools for visualization production, though it does provide some important aspects of visualization evaluation. I believe this paper would be better suited for discussion near the beginning of the class, as it provides a foundation on which to consider and discuss knowledge representation, which is one of the roots of information visualization.

**References**

Two references were cited as being particularly important to the conclusions of this paper,


Additionally, the work of another author in the references, Pat Hayes, is especially interesting, as it combines computational science and philosophy. His web site can be found at [http://www.ihmc.us/users/phayes](http://www.ihmc.us/users/phayes). Be sure to check out the section on “Computational and Philosophical Foundations of AI and Cognitive Science.”

The University of Edinburgh has a terrific AI program: [http://www.dai.ed.ac.uk/](http://www.dai.ed.ac.uk/)

Other work in combining AI and Philosophy can be found on the site of Dr. Luger, a professor at the University of New Mexico, [http://www.cs.unm.edu/~luger/](http://www.cs.unm.edu/~luger/)