

Chapter 6

Knowledge and Mental Models

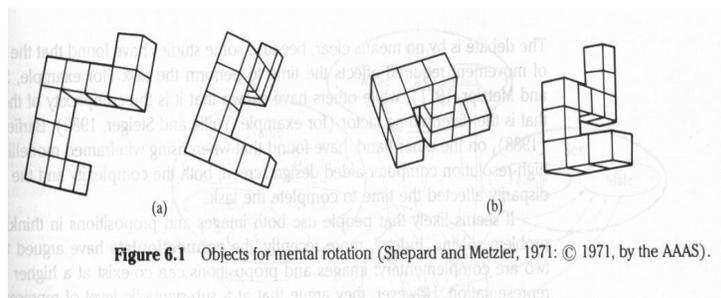
Knowledge Representation

- *analogical representation*--picture-like images
- *propositional representation*--abstract and language-like assertions
- *distributed representation*--networks of nodes where knowledge is implicit in the connections between the nodes

Distinct Forms of Mental Representation?

- *Imagists*--believe that images are distinct and play an important role in thinking and reasoning
- *Propositionalists*--believe that images are a by-product, of no purpose to cognitive functioning, and underlie all mental processing
- *Connectionists*--images and propositions can co-exist at a higher level of representation

Objects for Mental Rotation



Knowledge Organization

- *semantic networks*--are represented as nodes and links.
 - nodes correspond to objects
 - links correspond to relationships
- *schema*--a network of general knowledge based on previous experience
 - i.e. eating at a restaurant

Mental Models

- assumes to be dynamically constructed, as creations of the moment, by activating stored schemata
- allows us to make inferences in complex situations, predict future states and comprehend situations we have never experienced

Structural vs. Functional Models

- Structural model assumes that the user has internalized the structure of how the device or system works in memory
- Functional model assumes the user has internalized procedural knowledge about how to use the device or system

Structural Model

- Advantage: by explaining how a device works, it allows the user to predict the effects of any possible sequence of actions, and hence work out how to achieve most tasks possible with the device.
 - i.e. use when device breaks down (engineering or electronics)

Functional Model

- developed from past knowledge of a similar domain
- structured around a set of tasks

Levels of Process Control

- *skill-based level*--normal way of interacting with the system
- *rule-based level*--situations of the process plant that are familiar to the controllers and that can be resolved by applying learned routines
- *knowledge-based level*--conscious and analytic process that occurs when the operators are confronted with novel and unexpected situations