AITA - Exercise Sheet 4

This week we have a set of questions about knowledge representations. They should be read in conjunction with your lecture notes and handouts for Week 5.

Question 1

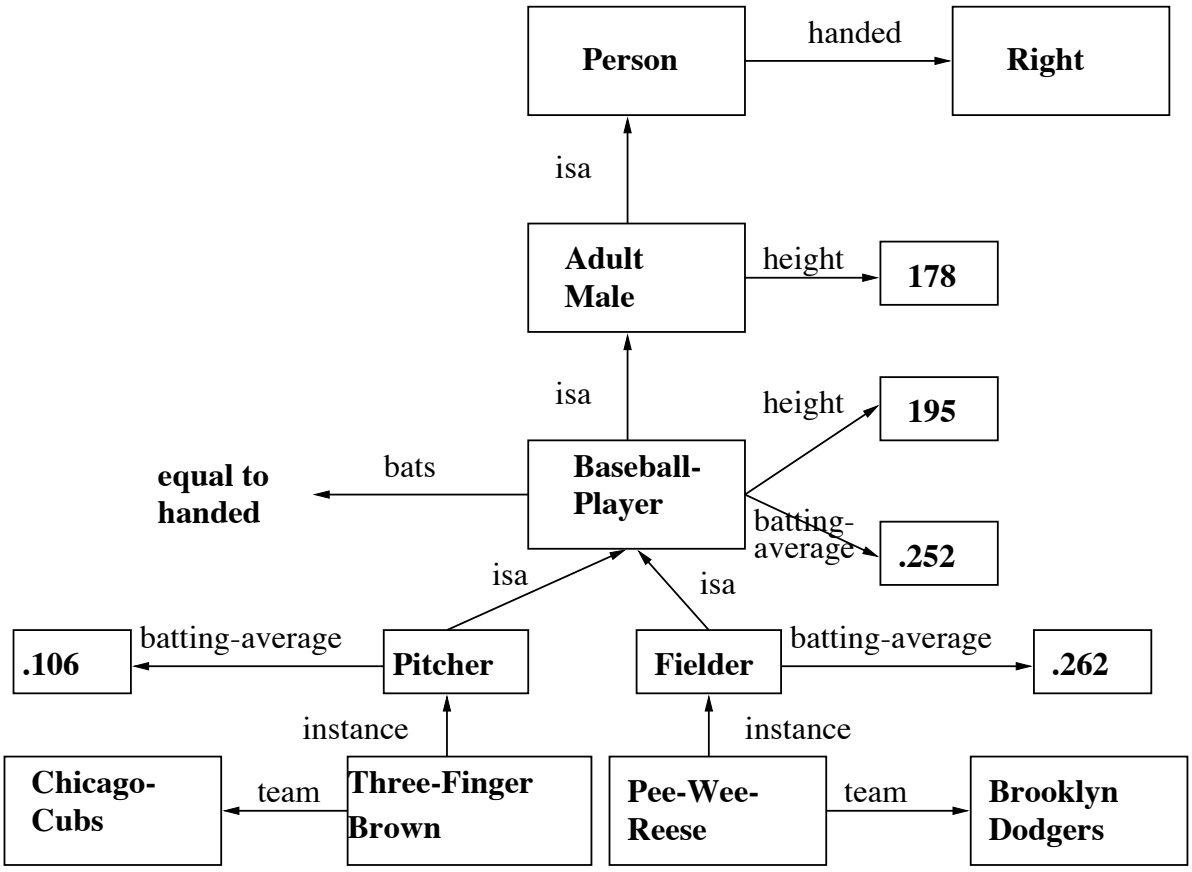
Is the following dilemma a problem for AI systems? If so, how can we deal with it?

(a) An AI system must contain a lot of knowledge if it is to handle anything beyond trivial toy problems.

(b) As the amount of knowledge grows, it becomes harder to access the appropriate information when needed, so more knowledge must be added to help. But then there will be even more knowledge to manage, and so more must be added, and so on…

Question 2

Recall the semantic network about baseball players from the lectures and Rich & Knight:



Consider how the same information could be represented in natural language. What about as a frame based system? Or in terms of first order logic? Is one form of representation clearly better than the others, or are there advantages and disadvantages to each? Are there aspects of baseball players that none of these forms of representation can accommodate?

Question 3

Represent the relationships between quadrangle, parallelogram, rhombus, rectangle and square in the form of a semantic network. Is the semantic network unique, or are there many different forms it can take? Now represent the same items as a series of frames. How easy is it to translate between the semantic network and frame based representations. How could the concept of perimeter be best implemented in each case?

Question 4 (14% of May 2003 AI Techniques Exam)

(a) What are the principal requirements of a good AI knowledge representation? [4%]

(b) In the context of knowledge representation languages, what do the terms "syntax" and "semantics" refer to? Provide a simple example. [3%]

(c) Knowledge representations can be broken down into lexical, structural, semantic and procedural components. What are these components of a Semantic Network? [4%]

(d) Design a simple semantic network to represent the natural language sentence "John the lecturer gave exam A06438 to his students". [3%]

Question 5 (10% of August 2002 AI Techniques Exam)

(a) Represent the following knowledge in a semantic network:

Dogs are Mammals	Birds have Wings
Mammals are Animals	Bats have Wings
Birds are Animals	Bats are Mammals
Fish are Animals	Dogs chase Cats
Worms are Animals	Cats eat Fish
Cats are Mammals	Birds eat Worms
Cats have Fur	Fish eat Worms
Dogs have Fur	

[6%]

(b) Suppose you learn that *Tom* is a cat. What additional knowledge about *Tom* can be derived from your representation? Explain how. [2%]

(c) Suppose Tom is unlike most cats and doesn't eat fish. How could one deal with this in the semantic network? [2%]