# IAI - Exercise Sheet 6

*This week we have a set of questions about semantic networks and frame based systems. They should be read in conjunction with your lecture notes and handouts for Week 6.*

## Question 1  (Exam style question)

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 the frame based representation? How could the concept of perimeter be best implemented in each case?

## Question 2

How would you represent the following statements using semantic networks:

"John tells his students a lot of useful things."

"Andrea tells John's students an enormous number of useful things."

Suppose you wanted to build an AI system that was able to work out who tells John's students the greatest number of useful things. How could you do that?

## Question 3  (Exam style question)

(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 | |

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

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

## Question 4

(a)  Represent your Semantic Network from Question 3 as a series of Frames.

(b)  Is the Semantic Network or the series of Frames easier for a human to understand and use?

(c)  Is the Semantic Network or the series of Frames easier for a human to program for processing on a standard computer?

(d)  Is the Semantic Network or the series of Frames easier for a computer to process and use?

(e)  What other factors are important when choosing between Semantic Networks and Frame based representations?

## Question 5

Consider the frame that we might create for the Brooklyn Dodgers baseball team:
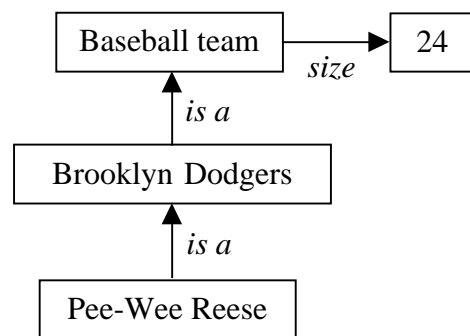


This is obviously an ***instance*** of a baseball team, but it is also a ***set/class*** of players of which Pee-Wee-Reese is an instance.  We need to be very careful about how we set up the hierarchy because we clearly don't want Pee-Wee-Reese to inherit the general properties of baseball teams (e.g. size 24), but we do want Brooklyn Dodgers to inherit the properties that baseball teams have, and individual baseball players to inherit general properties of baseball players. How can we deal with such cases?                    [Hint: See Rich & Knight, Section 9.2]

## Question 6

***Scripts*** are Minsky's original idea of a frame based structure that describes stereotyped sequences of events in a particular context.  What are the typical kinds of information that will need to be included in the slots of such frames?  When formulating scripts there are standard components that include: Entry conditions, Roles, Props, Primitive acts, Scenes, Tracks, and Results.  What do each of these terms refer to, and how do they relate to each other?                    [Hint: See Rich & Knight, Section 10.2]