Programming Assignment 2 – Due October 23

This project assignment has two Knowledge Representation-Computational Logic programming tasks. You will use the XSB logic programming system for this assignment. It is downloadable from http://xsb.sourceforge.net/.

1. The Monkey and Banana Problem -

In a room there is a banana hanging from the ceiling. There is also a chair in the same room. A clever monkey is let into this room. The monkey wants to get to the banana. It so turns out that if the monkey can stand on the chair it can reach the banana and grasp it.

The task here is to logically deduce the sequence of steps that the monkey has to take to eat the banana. You will specify the problem as a Logic Program. A query *reach(X)* to the program should return the answer, which will be the sequence of steps, in the variable X.

The following predicates and functions will be useful for encoding the problem:

X,Y,Z, S are logical variables.

1. *p(X,Y,Z,S)* is a Prolog predicate that asserts: *S* is the current state of the room with the monkey in location *X*, the banana is hanging above location *Y* and the chair is in location *Z*.
2. Let *S* be the current state with the monkey in location *X*. In this state the monkey can walk from X to position Y and the new state becomes *walk(X,Y,S)*.
3. Let *S* be the current state with the monkey as well as the chair in the same location *X*. In this state the monkey can push the chair from X to position Y and the new state becomes *push(X,Y,S)*.
4. Let *S* be the current state with the monkey as well as the chair in the same location *X*. In this state the monkey can climb the chair and the new state becomes *climb(S)*.
5. *reach(grasp(climb(s)))* is a predicate that asserts that in state *climb(S)* the monkey can grasp the banana whenever the location of the banana coincides with that of the monkey and the chair.

Assume that in the starting state *i the* monkey is in location *a*, the banana is hanging over location *b* and the chair is at position *c*.

2. The Analogy Problem –

Consider the task of solving geometric analogy problems. A list of figures is given. Three figures A,B, C are singled out and the question is: "If figure A is related to figure B, then what figure is C related to.

Write a Logic Program for this problem.
You will use the following two sets of figures to test your programs:
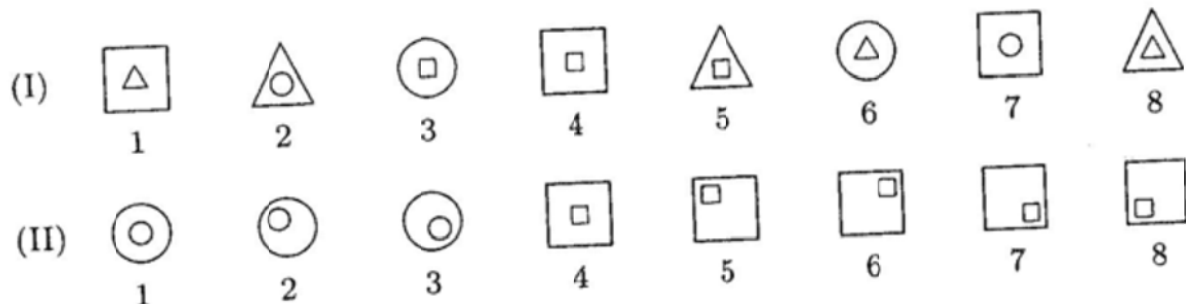
The following predicates will be useful for encoding:

Represent each figure as a fact describing the relationship between its components. For example, figure 1 in set (I) can be represented by the fact:

figure(1, middle(triangle, square)).

relate is a predicate that relates two figures.
For example, the fact *relate(middle(F1,F2),middle(F2,F1), invert).* asserts that two figures *A* and *B* made up of the two components *F1* and *F2* are related by the *invert* relation. As illustration of such a relation see Figure 1 and Figure 5 in set (I).

You should define other such *relate* facts by carefully studying the figures in set (I) and (II).

Your program should take a query *analogy((A,B),(C,X))* and return a integer number in X such that the figure corresponding to that number is related to C in the same way as A is related to B.
Example: *analogy ((1,5),(3,X))* will rerun X=7 for Set (I).

Submission:
On the due date you should email to the TA a zip file containing:
    • Source code with good documentation
    • A trace of the execution of each program

You have until midnight of the due date to email the zip file.

You should sign up for a demo with a TA. On the demo date you will be given your source files that you should compile and demo to the TA.