

Cosc 2P93: Prolog

Assignment #1

Due date: January 31<sup>st</sup>, 2012 (in class!)

**1. Family tree. Using the following facts:**

male, female, begot, wed.

**Write relations (rules) that define the following:**

brother, sister, sibling, father, mother, parent, wife, husband, spouse, sister-in-law, brother-in-law, mother-in-law, father-in-law, uncle, aunt, cousin (first-cousin only), ancestor (think recursion here), related, unrelated.

Reuse other relations when logical. e.g. It makes sense for *brother* to make use of *sibling*.

Include enough facts (make up names if you like) that will allow for all of these relations. Also, make sure you include a 'reasonable' number of examples in your printout (see submission guidelines below).

You will need to include precautions that ensure that nobody is their own sibling, cousin, etc. Also, please avoid anyone being their own grandfather (even if it's implied that it involves time travel to Roswell), or other peculiar relationships.

You may, of course, create additional relations to make the ones listed above easier to implement.

Note that some details are intentionally left out, including appropriate ways to structure facts.

*Also note that aunt and uncle are trickier than they appear, as are brother-in-law and sister-in-law!*

**2. Unification.** Do the following expressions unify? If so, give their variable substitutions. If not, indicate why.

Work them out by hand, and verify your answers in Prolog (or vice versa).

(a)  $100 = 5 * 5$

(b)  $100 = 10 * 10$

(c) Apples = oranges

(d)  $\text{struct}(A, b(C, d), e) = \text{struct}(X, X, Y)$

(e)  $[1, 2, 3] = [\text{First} \mid \text{Last}]$

(f)  $[1 \mid [2, 3]] = [\text{Last} \mid \text{First}]$

(g)  $\text{hello}(\text{this}, \text{Is}, \text{Odd}25) = \text{hello}(\text{This}, \text{is})$

(h)  $[1, Y, 3] = [A \mid B], 25 = Y.$

(i)  $[ [ [ a, b ] ] \mid c ] = [ H \mid T ]$

(j)  $[a(25, b), c(B), B \mid T] = [X, c(400), D, D]$

(k)  $\text{oh}(MY) = MY$

(l)  $\text{Ans} = 25 * 4$

**3. Unification & Arithmetic.** What will Prolog's answers be to the following? Work them out by hand, and verify them in Prolog (or vice versa).

(a) Ans is  $25 * 4$ .

(b)  $\text{Cat} = 5, \text{Dog} = 6, \text{Horses} \text{ is } \text{Cat} + \text{Dog}, \text{Cows} = \text{Cat} + \text{Dog}.$

(c)  $\text{mazda}(\text{RX}8, 5) = \text{mazda}(\text{rx}8, X), Y \text{ is } X + 1$

(d)  $\text{mazda}(\text{RX}8, Y) = \text{mazda}(Z, Z), Y \text{ is } 1 + 1.$

(e)  $s(2,3,4) = s(X,Y,Z), Z \text{ is } X + X, Y \text{ is } Z + 1.$

(f)  $s(X,Y,Z) = s(4,3,2), W \text{ is } X * Z, X \text{ is } Z + A.$

(g)  $[2, X, 3] = [H \mid T], W \text{ is } H + 25.$

(h)  $100 \text{ is } Z - A, Z \text{ is } 1000, A = 900.$

(i)  $Z \text{ is } 1000, A = 900, 100 \text{ is } Z - A.$

#### 4. Zoology rules.

(a) Convert the following sentences into Prolog:

An animal is big if it weighs more than 50 kg.  
An animal is small if it weighs less than 5 kg.  
An animal is medium if it is not big and it is not small.  
An animal is biggish if it is medium or it is big.  
An animal is smallish if it is medium or it is small.  
An animal is tropical if it lives in a jungle.  
An animal is tropical if it lives on a savannah.  
An animal is marine if it lives in the ocean.  
An animal is forest-dwelling if it is neither marine nor tropical.  
An elephant is 900 kg.  
A mouse is 1 kg.  
A poodle is 6 kg.  
A cat is 7 kg.  
A whale is 2000 kg.  
A man is 70kg.  
A whale lives in the ocean  
A man lives on a savannah  
A man lives in a jungle.

(b) Define rules for one or more property an animal might have. Add facts to the animals listed above to fit your new property. Add a new animal (or more), and add facts to define its properties.

(c) Compose queries to answer the following questions. Also compose a few queries that test your own properties and animals from (b).

Is a poodle big?  
Is a poodle smallish?  
What is a smallish animal?  
What is a big animal?  
What is a marine animal?  
Where does a man live?  
Where does a kwyjibo live?

#### Submission Guidelines:

Print out all of your prolog code and include a sample of running any relevant queries.

(When queries are explicitly mentioned above, use those. Otherwise, include whatever is necessary to basically demonstrate your code. When deciding how many examples are necessary, remember this: Be nice to the marker, and he will be nice to you.)

Electronic submission is required. Slap your files into a dedicated directory on sandcastle, ssh (or putty) in, and run 'submit2p93'.

A cover page (with barcode) is still necessary.

**Credit:** This assignment is shamelessly stolen (more or less) from Brian Ross. Mwahaha.