Birla Institute of Technology & Science-Pilani, Hyderabad Campus

First Semester 2017-2018

Principles of Programming languages (CS F301)

Assignment 3: Prolog   **Due Date: 20/11/2017**

Maximum Marks : 20

Goal and motivation:

This assignment aims at testing your understanding about Prolog and using Logic Programming to solve basic computer science problems and puzzles.

Problem Statements:

Q1. In an Engineering College there are four students, Arpit, Manoj, Shrishti, and Dhruv who study different majors. The task of this problem is to identify their respective majors, their TV show preferences, and their birth year. The possible values for each attribute are as follows:

Major - computer_science, electronics, mechanical, civil

TV show preference - house_of_cards, black_mirror, mr_robot, suits

Birth years - 1994, 1995, 1996, 1997

Note: Each attribute mentioned has a unique value for each individual.

We know about some details related to these students. To solve this puzzle, use the information given below.

1. The student interested in the TV show **suits** was born in **1996**.
2. The student interested in the TV show **house_of_cards** was born after the student doing **electronics** as major.
3. Shrishti is not the student who has **computer_science** as their major.
4. Either the student who has **electronics** as his/her major or Dhruv was born in **1996**. The other student was born in **1995**.
5. Manoj was not born in **1995**.
6. The student who likes the TV show **black_mirror** has **computer_science** as his/her major.
7. The major for Dhruv or Arpit is **mechanical**.
8. Neither Shrishti nor Arpit likes **house_of_cards**.
9. The student who has his/her major as **computer_science** was born before Dhruv.
10. The student who likes **suits** has either **civil** or **mechanical** as his/her major.

Note: Your answers should be in the form of Student_name = [Major, TV_Show, Birth_Year].

Q2. **Number to Words.**
Your task is to convert a numerical value into its equivalent written word form. Write a predicate num_to_words to print the (non-negative) integer numbers in full words.
For e.g. 254 can be written as two-hundred-fifty-four

Q3.**Relationship Puzzle**
 Given below is a database of relationships between people in LaLaLand. The predicate father (X ,Y) can be represented to indicate the fact "X is the father of Y". Similarly, female(X) can indicate "X is a woman". Write a prolog code that can identify the following relationships.

a)   Mother(X,Y)
b)   Brother(X,Y)
c)   Grandson(X,Y)
d)   Granddaughter(X,Y)
e)   Uncle(X,Y)
f)   Aunty(X,Y)
g)   Cousin(X,Y)

 Database facts

1. disney is the father of mickeymouse.
2. disney is the father of donaldduck
3. mickeymouse is the father of minto
4. mickeymouse is the father of morley
5. mickeymouse is the father of morty
6. mickeymouse is the father of maisie
7. donaldduck is the father of goofy
8. minto, morley, mickeymouse, donaldduck are men.
9. morty, maisie, minniemouse, nemo and daisyduck are women.
10. minniemouse is the wife of mickeymouse
11. nemo is the wife of goofy
12. daisyduck is the wife of donaldduck

Please assume the normal settings like marriage is only between a male and a female and all fathers are males (even if it's not specified).

Example queries:

?- Mother(minto,minniemouse)
True.

?-cousin(morty,X)
X= goofy
True
X=nemo
False.

Q4. Median of a list of numbers
Write a program to find out the median of a list of numbers.

Q5. Pastries

In this problem we consider a database of pastry stores. Each store has a name, a list of employees, and a list of pastries that can be purchased in the store, which are encoded in a `store` predicate. Each pastry is defined by a name, a list of fruits, and a price, which are encoded in a `pastry` predicate. For example, here are three predicates defining three different pastry stores:

```
store(chai_coffee_company, [nike, nica, seth],
      [ pastry(berry, [orange, blueberry, strawberry], 2),
        pastry(tropical, [orange, banana, mango, guava], 3),
        pastry(blue, [banana, blueberry], 3) ]).

store(bits_and_bytes, [coet,dos],
      [ pastry(pinacolada, [orange, pineapple, coconut], 2),
        pastry(green, [orange, banana, kiwi], 5),
        pastry(purple, [orange, blueberry, strawberry], 2),
        pastry(smooth, [orange, banana, mango],1) ]).

store(yumpys, [arvin,vino,kart],
      [ pastry(combo1, [strawberry, orange, banana], 2),
        pastry(combo2, [banana, orange], 5),
        pastry(combo3, [orange, peach, banana], 2),
        pastry(combo4, [guava, mango, papaya, orange],1),
        pastry(combo5, [grapefruit, banana, pear],1) ]).
```

The first store has three employees and sells three different pastries, the second store has two employees and sells four different pastries, and the third store has three employees and sells five different pastries. You can assume that there are no duplicates (`pineapple` is not listed twice in any ingredient list, `nica` is not listed twice in any employee list, the same pastry specification is not listed twice in any store menu, etc.). Given a database of pastry store facts, implement the predicates given in 5.1 and 5.2.

5.1 Write a Prolog predicate more_than_four(X) that is true if store X has four or more pastries on its menu. For instance:

```
?- more_than_four(chai_coffee_company).
No

?- more_than_four(X).
X = bits_and_bytes ;
X = yumpys ;
No
```

5.2 Write a Prolog predicate exists(X) that is true if there is a store that sells a pastry named X. For instance:

```
?- exists(combo1).
Yes
```

```
?- exists(slimy).
No

?- exists(X).
X = berry ;
X = tropical <enter>
Yes
```

Deliverables:

1. Prolog codes for all the five questions

During the demo, your code should give correct answers to multiple queries like the example queries given above.

Submissions:

The assignment has to be submitted before the due date (11.59 p.m. on 20/11/2017) to

email id:- ppltwenty.17@gmail.com.

The subject of email should be "Assignment-3 First Sem 2017-18".

Please make sure that the body of the email has the names and id numbers of all the students in the group. Name the assignment zip folder as Asst3_id1_id2_id3. (Eg. Asst3_14005_14096_14130.tar.gz)

In case of any queries please contact

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