1. tutorial in Prolog

October 15, 2018

1 Prolog as a database

Familiarize yourself with the royal family of the British Monarchy. Consider the following people:

- william: Prince William of Wales
- harry: Prince Henry of Wales
- charles: The Prince Charles, Prince of Wales
- diana: Diana, Princess of Wales
- camilla: Camilla, Duchess of Cornwall
- george: George VI of the United Kingdom
- elizabeth: Elizabeth II, HM The Queen
- philip: Prince Philip, Duke of Edinburgh
- edward: The Prince Edward, Earl of Wessex
- sophie: Sophie, Countess of Wessex
- louise: Princess Louise of Wessex
• james: Prince James of Wessex

and their relationships:

• male(X) means that X is a man.
• female(X) if X is a woman.
• parent(P,C) if P is the parent of C. E.g. P can be Lady Diana and C Prince William. Not the other way round!
• wife(W,H) if W is (or was) the wife of H.

Task 1: Copy&Paste the code on the next page into a file “royal.pl”. It is loaded into Prolog by the “[filename]” command. The console should look like:

?- [royal].% royal compiled 0.00 sec, 30 clauses
true.

Task 2: Write a query to ask for all children of elizabeth.

Task 3: Define the predicate husband(Man,Woman). Do not list all husbands of all wives as ground facts! :-)

Task 4: Define person(P) to be either a male or a female.

Task 5: Define mother(Mother,Child) and father(Father,Child). Be careful not to define a son or a daughter.

Check your knowledge:

• What is a difference between a “Person” and a “person”?
• What is an underscore “_”? A singleton? Should you avoid it?
female(camilla).
female(diana).
female(elizabeth).
female(louise).
female(sophie).

male(charles).
male(george).
male(harry).
male(james).
male(philip).
male(william).

parent(charles,harry).
parent(charles,william).
parent(diana,harry).
parent(diana,william).
parent(george,elizabeth).
parent(james,elizabeth).
parent(philip,charles).
parent(philip,edward).
parent(sophie,james).
parent(sophie,louise).

wife(camilla,charles).
wife(diana,charles).
wife(elizabeth,philip).
wife(sophie,edward).
Task 6: Define the ancestor(Ancestor,Descendant), which connects parents with children, grandparents with grandchildren, grand-grandchildren with grand-grand-children, etc.

Task 7: Compare the two definitions of the father predicate:

a) father(F,C) :- male(F), parent(F, C).

b) father(F,C) :- parent(F, C), male(F).

Which of them is faster on the father(X, charles) query? Why?

Note. You can estimate Prolog’s speed by starting the trace mode:

```
?- trace.
true.
[trace] ?- ...
```

It can be turned off by the nodebug command.

Task 8 (optional): Study in advance! Learn about SLD trees and write two SLD trees for father1(X, charles) and father2(X, charles).

Task 9 (optional): Using the course literature or Google, study the “negation as failure \+” technique or “non-unifiability predicate \=”. Define the sibling(Sibling1,Sibling2,Parent) predicate: Sibling1 is the sibling of Sibling2 and Parent is their shared parent. Be careful, the person is not its own sibling. Therefore sibling(william,william,P) must fail!

Check your knowledge:

- What is a left-to-right rule?
- What is a top-to-bottom rule?