

SENG2200/6220 –Programming Languages & Paradigms

Computer Lab for Week 12, Semester 1, 2019

Objectives

This lab aims to build the understanding of the logical programming language Prolog.

- You may use an online Prolog environment for practice.
- E.g., <https://swish.swi-prolog.org/>

Questions

1. Consider the following Prolog program:

```
parent(X,Y) :- child(Y,X).
mother(X,Y) :- parent(X,Y),female(X).
father(X,Y) :- parent(X,Y),male(X).
grandparent(X,Y) :- grandchild(Y,X).
grandmother(X,Y) :- grandparent(X,Y),female(X).
grandfather(X,Y) :- grandparent(X,Y),male(X).
grandchild(X,Y) :- parent(Z,X),parent(Y,Z).
granddaughter(X,Y) :- grandchild(X,Y),female(X).
grandson(X,Y) :- grandchild(X,Y),male(X).
daughter(X,Y) :- child(X,Y),female(X).
son(X,Y) :- child(X,Y),male(X).
```

```
male(fred).
male(bill).
male(jim).
female(sally).
female(mary).
female(kate).
female(anne).
```

```
child(bill,fred).
child(bill,sally).
child(mary,fred).
child(mary,sally).
child(kate,jim).
child(kate,mary).
child(anne,bill).
```

Trace through the following queries:

- a) ?- male(X).
- b) ?- parent(X,bill)
- c) ?- granddaughter(kate,X).
- d) ?- grandmother(X,kate),son(Y,X),child(Z,Y)
- e) ?- parent(jim,X),mother(Z,X),parent(Z,Y),father(W,Y)

2. Write a Prolog program to represent the following (note definitions not entirely accurate):

A mammal is a vertebrate that is warm-blooded and has hair.

A marsupial is a mammal that has a pouch.

A monotreme is a mammal that lays eggs.

There are 10 animals, a-j, which have the following properties:

All the animals except j are vertebrates.

All the animals except i are warm-blooded.

All animals except a have hair.

Animals e, f, g, and h have pouches.

Animals b, e, g, and j lay eggs.

3. Using your program from Q2, write Prolog queries to determine the following:
- Which animals are mammals?
 - Which monotremes are also marsupials?
 - Which marsupials are not monotremes?