Types and Programming Languages week1

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1 (LPN) Practical session in class

In attached week1.pl file

2 (LPN) Exercise 1.1-1.5

1.1 Which of the following sequences of characters are atoms, which are variables, and which are neither?

1 vINCENT
atom

2 Footmassage
variable

3 variable23
atom

4 Variable2000
variable

5 big_kahuna_burger
atom

6 big kahuna burger
atom

7 big kahuna burger
neither

8 Jules
atom

9 _Jules
variable

10 _Jules
atom

1.2 Which of the following sequences of characters are atoms, which are variables, which are complex terms, and which are not terms at all? Give the functor and arity of each complex term.

1 loves(Vincent,mia)
complex term
functor = loves
arity = 2
variable = Vincent
atom = mia

2 loves(Vincent,mia)
atom

3 Butch(boxer)
neither

4 boxer(Butch)
complex term
functor = boxer
arity = 1 variable = Butch

5 and(big(burger),kahuna(burger))
complex term
functor = and
arity = 2
funtor = big
arity = 1
atom = burger
functor = kahuna
arity = 1
atom = burger

6 and(big(X),kahuna(X))
complex term
functor = and
functor = big
variable = X

functor = kahuna

variable = X

7 _and(big(X),kahuna(X))

complex term

functor = and

functor = big

variable = X

functor = kahuna

variable = X

8 (Butch kills Vincent)

neither

9 kills(Butch Vincent)

neither

10 kills(Butch,Vincent

neither

1.3 How many facts, rules, clauses, and predicates are there in the following knowledge base? What are the heads of the rules, and what are the goals they contain?

woman(vincent).

woman(mia).

man(jules).

person(X):- man(X); woman(X).

loves(X,Y):- father(X,Y).

father(Y,Z):- man(Y), son(Z,Y).

father(Y,Z):- man(Y), daughter(Z,Y).

Facts = 3

Rules = 4

Clauses = 7

Predicates = 5

Heads of rules = person(X), loves(X,Y), father(Y,Z)

goals = man(X), woman(X), father(X,Y), son(Z,Y), daughter(Z,Y)

1.4 Represent the following in Prolog:

1. Butch is a killer.

   killer("Butch").

2. Mia and Marsellus are married.

   married("Mia","Marsellus").

3. Zed is dead.
   dead("Zed").

4. Marsellus kills everyone who gives Mia a footmassage.
   kills("Marsellus"):- footmassage("Mia",X).

5. Mia loves everyone who is a good dancer.
   loves("Mia"):- good_dancer(X).

6. Jules eats anything that is nutritious or tasty.
   eats("Jules"):- nutritious(X); tasty(Y).

1.5 Suppose we are working with the following knowledge base:

wizard(ron).
hasWand(harry).
quidditchPlayer(harry).
wizard(X):- hasBroom(X), hasWand(X).
hasBroom(X):- quidditchPlayer(X).
How does Prolog respond to the following queries?

1. wizard(ron).
   true.

2. witch(ron).
   false.

3. wizard(hermione).
   false.

4. witch(hermione).
   false.

5. wizard(harry).
   true.

6. wizard(Y).
   ron;
   harry.

7. witch(Y).
   false.