Knowledge representation

Tutorial 3

11 October 2013

Correction of proposed exercise

1. Goldbach's conjecture is one of the most famous facts in number theory that has not been proved to be correct in the general case.
It says that : *Every positive even number greater than 2 is the sum of two prime numbers.*

Example: $28 = 5 + 23$.

Define a predicate `goldbach(+X, -Y, -Z)` that succeeds if `X` = `Y` + `Z` where `X` is an even integer greater than 2 and `Y`, `Z` two prime numbers.

Exercises

2. Define a predicate `sub(+A, +B, +Ls, -Zs)` that succeeds if the list `Zs` is the list `Ls` in which each occurrence of `A` has been replaced by `B`.

3. Define a predicate `swap(+A, +B, +Ls, -Zs)` that succeeds if the list `Zs` is the list `Ls` in which each occurrence of `A` has been replaced by `B` and each occurrence of `B` has been replaced by `A`.

4. Define a predicate `sub_depth(+A, +B, +Ls, -Zs)` that succeeds if the list `Zs` is the nested list `Ls` in which each occurrence of `A` has been replaced by `B`.

```
?- sub_depth(a, s, [x, [a, b, c, [h, a]], [[[a], [b]], a]], X).

    X = [x, [s, b, c, [h, s]], [[[s], [b]], s]] ;
    false.
```

5. Define a predicate `tricoup(-Ls, -As, -Bs, -Cs)` that succeeds if the list `Ls` is the concatenation of the non-empty lists `As`, `Bs` and `Cs`.

6. Define a predicate `inc_sublist(+Ls, -Ss)` that succeeds if the list `Ss` is the first longest increasing sublist of the list of numbers `Ls`.

Proposed exercises

7. Define a predicate `occur(+Ls, -Zs)` that succeeds if the list `Zs` is the list of the occurrence of `Ls`'s elements.

```
?- occur([a, b, a, a, b, c, a], X).

    X = [[a|4], [b|2], [c|1]] ;
    false.
```

8. Suppose that we have a set of denominations (coins of 1 euro, 2, banknotes of 5, 10, 20, 50, 100, 200, 500) and we want to know the number of possible ways to pay a certain amount. Define a predicate to compute this number.