Knowledge representation

Tutorial 7

15 November 2013

Correction of proposed exercises

1. Three thieves have robbed a wine barrel of 24 liters. They would like to divide the wine in three equal parts (8 liters each). Unfortunately, they only have at their disposal three vessels : one of 5 liters, one of 11 liters and one of 13 liters.

Write a prolog program to solve this decanting problem.

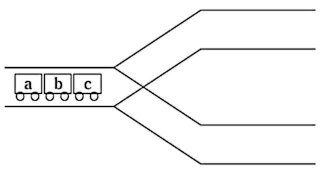
2.
8-puzzle (sliding puzzle) :
The 8-puzzle is a smaller version of the slightly better known 15-puzzle.
The puzzle consists of an area divided into a grid, 3 by 3 for the 8-puzzle (4 by 4 for the 15-puzzle). On each grid square is a tile, expect for one square which remains empty. Thus, there are eight tiles in the 8-puzzle. A tile that is next to the empty grid square can be moved into the empty space, leaving its previous position empty in turn. Tiles are numbered, 1 to 8 for the 8-puzzle, so that each tile can be uniquely identified.

The aim of the puzzle is to get the configuration where all the tiles are ordered from any given starting configuration.

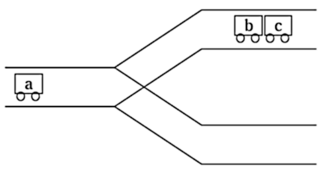
Write a prolog program to solve this puzzle.
(Hint: the puzzle doesn't always have a solution !)

3. You are a train driver. Your train is represented by a list of the form $[c_1, c_2, ..., c_n]$ where c_i are the cars. The locomotive is supposed to be on the left of the car c_1 but is not explicitly represented.
You are in a marshalling yard and your task is to rearrange the cars in a specific order. The marshalling yard has two sorting tracks where you can push or remove cars.

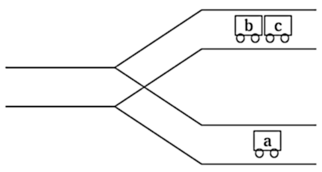
Here is a example of the rearrangement of the train $[a, b, c]$ to $[b, c, a]$.



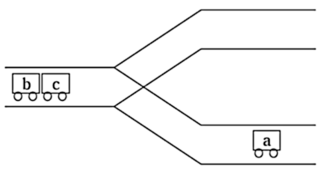
(a)



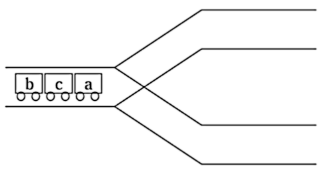
(b)



(c)



(d)



(e)

Write a prolog program to compute the movements necessary to rearrange a train.

Exercises

<u>**4.**</u> Define a predicate `listOfPred(+Pred(...), -Ls)` that succeeds if the list `Ls` is a list where the first element is the predicate `Pred` and the next are the arguments of the predicate `Pred`.

```
?- listOfPred(between(1, 100, X), Ls).
   Ls = [between, 1, 100, X].
```

<u>**5.**</u> Define a predicate `applyPred(+Pred, +Args)` that succeeds if `Pred(Args)` is true.

<u>**6.**</u> Define a predicate `filter(+L1, +Pred, -L2)` that succeeds if `L2` is the list of `L1`'s elements that satisfy the predicate `Pred`.

Memoization

<u>**7.**</u> Define a predicate to compute the function `f` :

$$f(n) = n \text{ si } 0 \leq n \leq 2$$

$$f(n) = [2f(n-1) + 3f(n-2) + 5f(n-3)]\ mod\ (n+1) \text{ si } n > 2$$