

Prolog Lists P2

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2. Determine the predecessor of a number represented as digits in a list.
E.g.: [1 9 3 6 0 0] to [1 9 3 5 9 9]

Mathematical Models

$$pred(l_1, \dots, l_n, c) = \begin{cases} 9 & \text{if } n = 1 \text{ and } l_1 = 0 \\ l_1 - 1 & \text{if } n = 1 \\ pred(l_1, nc) \cup pred(l_2, \dots, l_n, nc) & \text{if } c = 1 \\ l_1 \cup pred(l_2, \dots, l_n, nc) & \text{otherwise} \end{cases}$$

$$predecessor(l_1, \dots, l_n) = pred(l_1, \dots, l_n, 0)$$

Meaning of predicates. Flow models. Source Code

```
% predecessor_(L : List, C : Integer, R : List)
% L - list of numerical atoms (only digits)
% C - numerical atom representing a carry
% R - the resulting list
% flow model (i, i, i), (i, o, o), (i, i, o), (i, o, i)
predecessor_([E], 1, [9]) :- E is 0, !.
predecessor_([E], 0, [R]) :- R is E - 1, !.
predecessor_([H | T], C, [R | RT]) :-
    predecessor_(T, 1, RT), !,
    predecessor_([H], C, [R]).
predecessor_([H | T], 0, [H | R]) :- predecessor_(T, 0, R).

% predecessor(L : List, R : List)
% wrapper for predecessor_
% L - list of numerical atoms (only digits)
% R - the resulting list
```

```
% flow model (i, i), (i, o)
predecessor(L, R) :- predecessor_(L, 0, R).
```

Examples

```
?- predecessor([1,9,3,6,0,0], Pred).
Pred = [1, 9, 3, 5, 9, 9].
```

```
?- predecessor([1,9,3,6,0,5], Pred).
Pred = [1, 9, 3, 6, 0, 4].
```