Programming Language hw5

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1 hanoi

과제에 대한 설명은 코드 내에 주석으로 적었습니다.

1.1 code

```
hanoi(X) :- move(X,1,2,3).
% 하노이를 호출하면 move함수를 호출.

move(0,_,_,_) :- !.
%N이 1일 경우 M이 0이 되며 이때는 옮길 원판이 없다는 의미가(한개만 있을 경우 옮길 필요x) 되어 재귀를
멈춰줘야하므로 !를 이용해 cut.
move(N,X,Y,Z) :-
            M is N-1,
            move(M,X,Z,Y),    % N-1개의 원판을 X번에서 Z번으로 옮긴다
            print_h(X,Y,N),   % N번째 원반을 목적지로 옮긴다(여기서 print를 해줘서 표현.재귀가 되면
N은 N-1이 되므로 N이 0이 되면 cut이 된 후 순차적으로 print될 것이다.)
            move(M,Z,Y,X).    % 다시 N-1개의 원판을 Z번에서 Y번으로 옮긴다

print_h(X,Y,N) :-
            write(N), write(' -> ['), write(X), write(','), write(Y), write(']'), nl.
% 재귀의 레벨이 되는 N이 몇번째 board를 움직이는지 나타낼 수 있으므로 그대로 write을 이용해 print해준
다.
```

1.2 trace

```
?- trace.
true.

[trace] ?- hanoi(3).
   Call: (10) hanoi(3) ? creep
   Call: (11) move(3, 1, 2, 3) ? creep
   Call: (12) _7462 is 3+ -1 ? creep
   Exit: (12) 2 is 3+ -1 ? creep
   Call: (12) move(2, 1, 3, 2) ? creep
   Call: (13) _7600 is 2+ -1 ? creep
   Exit: (13) 1 is 2+ -1 ? creep
   Call: (13) move(1, 1, 2, 3) ? creep
   Call: (14) _7738 is 1+ -1 ? creep
   Exit: (14) 0 is 1+ -1 ? creep
   Call: (14) move(0, 1, 3, 2) ? creep
   Exit: (14) move(0, 1, 3, 2) ? creep
   Call: (14) print_h(1, 2, 1) ? creep
   Call: (15) write(1) ? creep
1
```

```
   Exit: (15) write(1) ? creep
   Call: (15) write(' -> [') ? creep
 -> [
   Exit: (15) write(' -> [') ? creep
   Call: (15) write(1) ? creep
1
   Exit: (15) write(1) ? creep
   Call: (15) write(',') ? creep
,
   Exit: (15) write(',') ? creep
   Call: (15) write(2) ? creep
2
   Exit: (15) write(2) ? creep
   Call: (15) write(']') ? creep
]
   Exit: (15) write(']') ? creep
   Call: (15) nl ? creep

   Exit: (15) nl ? creep
   Exit: (14) print_h(1, 2, 1) ? creep
   Call: (14) move(0, 3, 2, 1) ? creep
   Exit: (14) move(0, 3, 2, 1) ? creep
   Exit: (13) move(1, 1, 2, 3) ? creep
   Call: (13) print_h(1, 3, 2) ? creep
   Call: (14) write(2) ? creep
2
   Exit: (14) write(2) ? creep
   Call: (14) write(' -> [') ? creep
 -> [
   Exit: (14) write(' -> [') ? creep
   Call: (14) write(1) ? creep
1
   Exit: (14) write(1) ? creep
   Call: (14) write(',') ? creep
,
   Exit: (14) write(',') ? creep
   Call: (14) write(3) ? creep
3
   Exit: (14) write(3) ? creep
   Call: (14) write(']') ? creep
]
   Exit: (14) write(']') ? creep
   Call: (14) nl ? creep

   Exit: (14) nl ? creep
   Exit: (13) print_h(1, 3, 2) ? creep
   Call: (13) move(1, 2, 3, 1) ? creep
   Call: (14) _9504 is 1+ -1 ? creep
   Exit: (14) 0 is 1+ -1 ? creep
   Call: (14) move(0, 2, 1, 3) ? creep
   Exit: (14) move(0, 2, 1, 3) ? creep
   Call: (14) print_h(2, 3, 1) ? creep
   Call: (15) write(1) ? creep
1
   Exit: (15) write(1) ? creep
   Call: (15) write(' -> [') ? creep
 -> [
   Exit: (15) write(' -> [') ? creep
   Call: (15) write(2) ? creep
2
   Exit: (15) write(2) ? creep
   Call: (15) write(',') ? creep
,
   Exit: (15) write(',') ? creep
   Call: (15) write(3) ? creep
3
   Exit: (15) write(3) ? creep
   Call: (15) write(']') ? creep
]
   Exit: (15) write(']') ? creep
   Call: (15) nl ? creep

   Exit: (15) nl ? creep
   Exit: (14) print_h(2, 3, 1) ? creep
   Call: (14) move(0, 1, 3, 2) ? creep
   Exit: (14) move(0, 1, 3, 2) ? creep
   Exit: (13) move(1, 2, 3, 1) ? creep
   Exit: (12) move(2, 1, 3, 2) ? creep
   Call: (12) print_h(1, 2, 3) ? creep
   Call: (13) write(3) ? creep
3
   Exit: (13) write(3) ? creep
   Call: (13) write(' -> [') ? creep
 -> [
   Exit: (13) write(' -> [') ? creep
   Call: (13) write(1) ? creep
1
   Exit: (13) write(1) ? creep
   Call: (13) write(',') ? creep
,
   Exit: (13) write(',') ? creep
   Call: (13) write(2) ? creep
2
   Exit: (13) write(2) ? creep
   Call: (13) write(']') ? creep
]
   Exit: (13) write(']') ? creep
   Call: (13) nl ? creep

   Exit: (13) nl ? creep
   Exit: (12) print_h(1, 2, 3) ? creep
   Call: (12) move(2, 3, 2, 1) ? creep
   Call: (13) _11314 is 2+ -1 ? creep
   Exit: (13) 1 is 2+ -1 ? creep
   Call: (13) move(1, 3, 1, 2) ? creep
   Call: (14) _11452 is 1+ -1 ? creep
   Exit: (14) 0 is 1+ -1 ? creep
   Call: (14) move(0, 3, 2, 1) ? creep
   Exit: (14) move(0, 3, 2, 1) ? creep
   Call: (14) print_h(3, 1, 1) ? creep
   Call: (15) write(1) ? creep
1
   Exit: (15) write(1) ? creep
   Call: (15) write(' -> [') ? creep
 -> [
   Exit: (15) write(' -> [') ? creep
   Call: (15) write(3) ? creep
3
   Exit: (15) write(3) ? creep
   Call: (15) write(',') ? creep
,
   Exit: (15) write(',') ? creep
   Call: (15) write(1) ? creep
1
   Exit: (15) write(1) ? creep
   Call: (15) write(']') ? creep
]
   Exit: (15) write(']') ? creep
   Call: (15) nl ? creep

   Exit: (15) nl ? creep
   Exit: (14) print_h(3, 1, 1) ? creep
   Call: (14) move(0, 2, 1, 3) ? creep
   Exit: (14) move(0, 2, 1, 3) ? creep
   Exit: (13) move(1, 3, 1, 2) ? creep
   Call: (13) print_h(3, 2, 2) ? creep
   Call: (14) write(2) ? creep
2
   Exit: (14) write(2) ? creep
   Call: (14) write(' -> [') ? creep
 -> [
   Exit: (14) write(' -> [') ? creep
   Call: (14) write(3) ? creep
3
   Exit: (14) write(3) ? creep
   Call: (14) write(',') ? creep
,
   Exit: (14) write(',') ? creep
   Call: (14) write(2) ? creep
2
   Exit: (14) write(2) ? creep
   Call: (14) write(']') ? creep
]
   Exit: (14) write(']') ? creep
   Call: (14) nl ? creep

   Exit: (14) nl ? creep
   Exit: (13) print_h(3, 2, 2) ? creep
   Call: (13) move(1, 1, 2, 3) ? creep
   Call: (14) _13218 is 1+ -1 ? creep
   Exit: (14) 0 is 1+ -1 ? creep
   Call: (14) move(0, 1, 3, 2) ? creep
   Exit: (14) move(0, 1, 3, 2) ? creep
   Call: (14) print_h(1, 2, 1) ? creep
   Call: (15) write(1) ? creep
1
   Exit: (15) write(1) ? creep
   Call: (15) write(' -> [') ? creep
 -> [
   Exit: (15) write(' -> [') ? creep
   Call: (15) write(1) ? creep
1
   Exit: (15) write(1) ? creep
   Call: (15) write(’,’) ? creep
,
   Exit: (15) write(’,’) ? creep
   Call: (15) write(2) ? creep
2
   Exit: (15) write(2) ? creep
   Call: (15) write(’]’) ? creep
]
   Exit: (15) write(’]’) ? creep
   Call: (15) nl ? creep

   Exit: (15) nl ? creep
   Exit: (14) print_h(1, 2, 1) ? creep
   Call: (14) move(0, 3, 2, 1) ? creep
   Exit: (14) move(0, 3, 2, 1) ? creep
   Exit: (13) move(1, 1, 2, 3) ? creep
   Exit: (12) move(2, 3, 2, 1) ? creep
   Exit: (11) move(3, 1, 2, 3) ? creep
   Exit: (10) hanoi(3) ? creep
true.
```