

人工智能原理与方法

(三) 逻辑和搜索

Modern Artificial Intelligence
& Applications

Zengchang Qin (秦曾昌)
zengchang.qin@gmail.com

Review

- ▶ Logic
- ▶ Prolog
- ▶ Knowledgebase
- ▶ Logical reasoning



Propositional Logic is not enough!

- ▶ Propositional Logic (Boolean logic) has declarative nature in which knowledge and inference are separate.
- ▶ Propositional Logic has confirmative values but in lack of the ability of handling partial information.
- ▶ Compositionality: the meaning of a sentence is a function of the meaning of its parts.



List Basics

Variable	Elements	Assignments
$[X \mid Y]$	$[a, b, c]$	$X=a, Y=[b, c]$
$[X \mid Y]$	$[a]$	$X=a, Y=[]$
$[a \mid Y]$	$[X, b]$	$X=a, Y=[b]$
$[X, Y, Z]$	$[a, b, c]$	$X=a, Y=b, Z=c$
$[[a, Y] \mid Z]$	$[[X, b], [c]]$	$X=a, Y=b, Z=[[c]]$



List of Prolog

```
member(X, [X|R]).  
member(X, [Y|R]):- member(X,R).
```

```
member(X, [X|_]).  
member(X, [_|R]):- member(X,R).
```

```
takeout(X,[X|R],R).  
takeout(X,[F|R],[F|S]) :- takeout(X,R,S).
```

```
append([X|Y],Z,[X|W]) :- append(Y,Z,W).  
append([],X,X).
```

```
reverse([X|Y],Z,W) :- reverse(Y,[X|Z],W).  
reverse([],X,X).
```

```
perm([X|Y],Z) :- perm(Y,W), takeout(X,Z,W).  
perm([],[]).
```



Design a member function

`member(X, [X|_] ).`

`member(X, [Head|Tail] ) :- member(X, Tail).`

Goal: `member(a, [a, b, c, d] ).`

yes

Goal: `member(e, [a, b, c, d] ).`

no

Goal: `member(X, [a, b, c, d] ).`

X=a



append([], L, L).

append([H|T] , L2, [H|Tn]):-append(T,L2, Tn).

Goal: append([1, 2, 3] , [4, 5] , L).

L= [1, 2, 3, 4, 5]

Goal: append([1,2,3] , [4,5] , [1,2,3,4,5]).

yes

Goal: append([1,2,3] , [4,5] , [1,2,3,4,5,6]).

no

Goal: append([1, 2, 3] , Y, [1, 2, 3, 4, 5]).

Y= [4, 5]

Goal: append(X, [4, 5] , [1, 2, 3, 4, 5]).

X= [1, 2, 3]

Goal: append(X, Y, [1, 2, 3, 4, 5]).

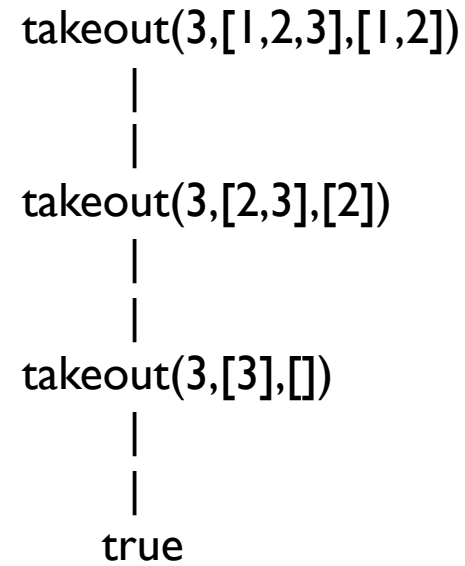
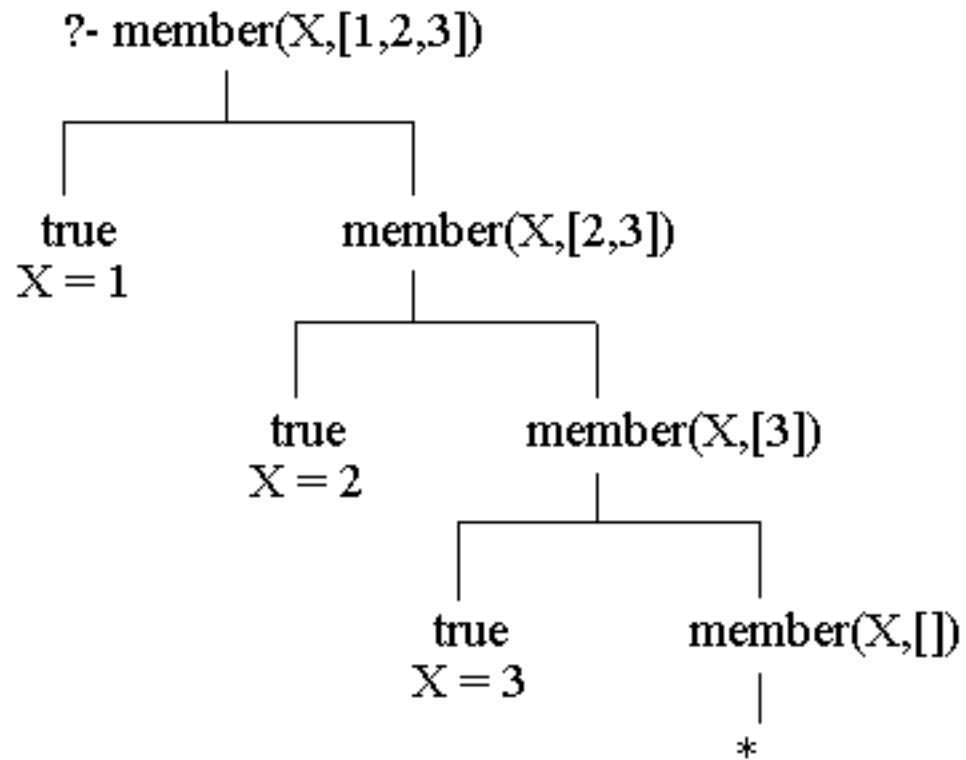
X= [] , Y= [1, 2, 3, 4, 5]

X= [1] , Y= [2, 3, 4, 5]

X= [1, 2] , Y= [3, 4, 5]

X= [1, 2, 3] , Y= [4, 5]

Explanation



?- reverse([1,2,3],[],A)

|

reverse([2,3],[1],A)

|

reverse([3],[2,1],A)

|

reverse([], [3,2,1], A)

|

true

A = [3,2,1]



Coloring problem

