

A.I. Theory Homework Week 2

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1. State space:

All possible combinations of number of Missionaries & cannibals on the of the river with regard to the constraint there can't be more cannibals than missionaries if missionary number is not 0.

So it can be represented as a vector $[m, c, b]$. The vector's elements represents the number of missionaries, cannibals, and whether the boat is on the wrong side of the river. following constraints, there will be these as valid states: $[3, 2, x]$ $[3, 1, x]$ $[3, 3, x]$ $[3, 0, x]$
 $[2, 2, x]$ $[1, 1, x]$ $[0, 1, x]$ $[0, 2, x]$ $[0, 3, x]$ $[0, 0, x]$ x can be (0, 1)

initial state: $[3, 3, 1]$

goal test: $[0, 0, 0]$

actions: a vector $[T_m, T_c, T_b]$ is added or subtracted to the state
e.g. $[0, 1, 1]$ represents a lone cannibal crossed the river.

actions can only be in of: $[1, 0, 1]$ $[2, 0, 1]$ $[0, 1, 1]$ $[0, 2, 1]$ $[1, 1, 1]$
 $[1, 0, 0]$ $[2, 0, 0]$ $[0, 1, 0]$ $[0, 2, 0]$ $[1, 1, 0]$

path cost: the number of one-way trips

2.

a) Graph search avoid visiting repeated nodes while tree search does not
Graph search inserts nodes into frontier after checking the state is not explored before, while tree search does not check.

b) state: a representation of the physical configuration

node: a data structure constituting graph/tree. it may include (state, parent/child node, cost, depth)
state is a field in node

C) states.

Because we only want to make sure we don't explore same 'abstract' condition repeatedly as it may occur extra computational cost. so it's state.

node on the other hand is impossible to explore repeatedly because they will have different parent node, depth and costs

3.

a) BFS graph search

	Frontier	Explored
1.	A	A
2.	AB, AC	A.B.C
3.	AC, ABD	A.B.C.D
4.	ABD	A.B.C.D
5.	ABDX	A.B.C.DX
solution: AB.D.X		

b) DFS graph search:

	Frontier	explored	
Step 1	A	A	
Step 2	AB, AC	A.B.C	
Step 3	AB, ACD	A.B.C.D	
Step 4	AB, ACDX	A.B.C.D.X	Solution ACDX

c) ACB, ACD, ABDC

d) ACB ACDB ACDBC

4.	a)	frontier	explored
		A	A
		AB AC	A.B.C
		AC, ABD	A.B.C.D
		ABD ACE ACF	A.B.C.D.E.F
		ACE, ACF, ABDH, ABDX.	A.B.C.D.E.F.H.X
		Solution: ABDX	

b)	frontier	explored
	A	A
	AB, AC	A.B.C
	AB ACE ACF	A.B.C.E.F.
	AB ACE ACFI	A.B.C.E.F.I
	AB ACE ACFIH	ABCEFIH
	AB ACE ACFIHD ACFIHX	ABCEFIHX

5. uniform Search

Frontier

explored

A 0
 AC 3 AB 5
 AB 5 AC 8 ACE 153
 ACF 8 ABD 55 ACE 153
 ACFI 11 ACFE 13 ABD 55
 ACFE 13 ACFIH 14 ABD 55
 ACFIH 14 ACFED 15
 ACFED 15 ACFIHx 24
 ACFEDx 16 ACFIHx 24

A
 A.C.B
 A.C.B.E.F
 A C B D E F
 A C D B F E I
 A C D B F E I H
 A C B D F E I H
 A C B D F E I H X
 A C B D F E I H X

Sol: ACFEDx = 16