

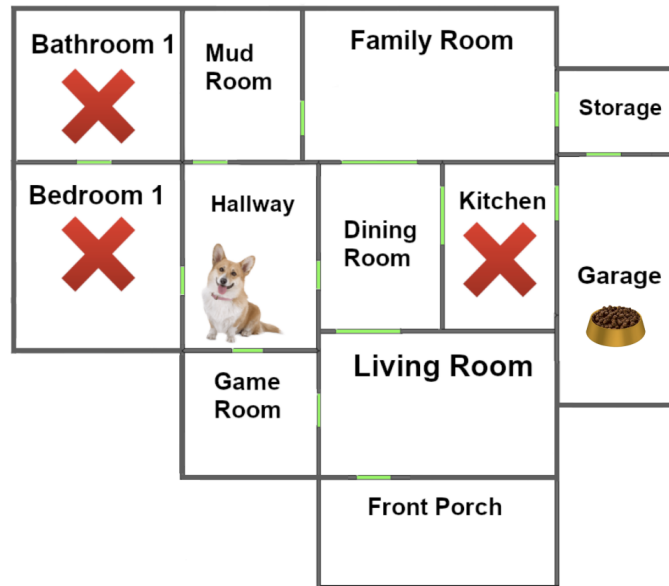
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Computer Science 383

Artificial Intelligence

Homework 5 Primer



Question 1

Part A

The set of moves will be up, down, left and right. $a = \{U, D, L, R\}$. We also have to account for this vacuum scenario where there is a 0.1 chance where the dog will move through the opposite door when entering a room (So there is a 0.1 chance when he moves U that he moves D, 0.1 chance he moves R when he moves L, etc.). The available moves from the dining room are:

$U = \{\text{Family Room } 0.9, \text{ Living Room } 0.1\}$

$D = \{\text{Dining Room } 0.9, \text{ Family Room } 0.1\}$

$L = \{\text{Hallway } 0.9, \text{ Kitchen } 0.1\}$

$R = \{\text{Kitchen } 0.9, \text{ Hallway } 0.1\}$

Part B

Recall that there is a 0.1 chance that Jeff runs the other way and from the hallway to the dining room.

Part C

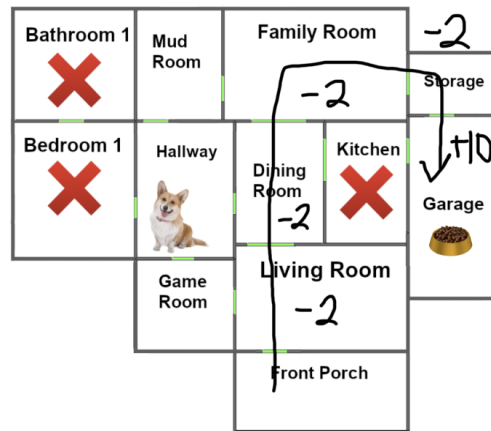
prohibited room= -2

allowed room=0

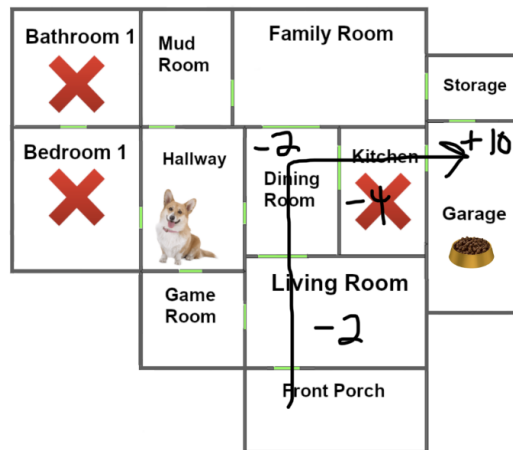
garage=10

any room= -2

There is more than one optimal policy now, consider the obvious path of avoiding prohibited rooms:



Path 1 has a weight of $-2 - 2 - 2 - 2 + 10 = 2$



Path 2 has the weight $-2 - 2 - 4 + 10 = 8$.

Both paths have the same weight even though the kitchen is a prohibited room. Jeff can still technically move through these rooms, it's just that there is an extra penalty of -2. This extra penalty is the same as it would be to go around the kitchen and through the family room and storage room.

Part D

You could make the optimum path Path 1 by increasing the penalty for going through a prohibited room. This would make the penalty for taking the shortcut through the kitchen cost more than going around through the family room and into the storage room.

Part E

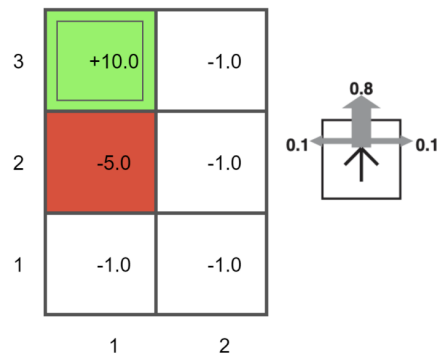
The goal state is no longer the garage, Jeff no longer has a hunger penalty and Jeff's fear of vacuum cleaners has returned. The hunger penalty has been removed so this can be changed to zero. As well, we want to incentivize Jeff to move through allowed rooms, so we should increase this to more than 0. Additionally, note that the reward for going into the garage should be changed the same as entering an allowed room and the penalty for entering a prohibited room should remain -2.

$$R_{\text{hunger}} = 0$$

$$R_{\text{room}} = 1$$

Question 2

rewards are 1 for all other states.



$$U_{i+1}(s) \leftarrow \underline{R(s)} + \gamma \max_a \left[\sum_{s'} P(s'|s, a) \underline{U_i(s')} \right]$$

Cole Feely									
CS 383									
HW5 Primer Q 2	U0						U1		
		1	2					1	2
	3	10	-1		disc. Fact.	0.9	3	10	6.02
	2	-5	-1				2	-5	-1.9
	1	-1	-1				1	-1.9	-1.9
	s	(1,1)	(1,2)	(2,1)	(2,2)	(2,3)			
	U1	-1	-1	5	-1	-1			
	U2	-1.9	-1.9	-1.9	-1.9	6.02			
	U3	-2.989	-2.471	-2.71	2.7134	6.5708			
(2,1)				(1,1)		(2,2)			
U1	-1.9	U2	-2.71	U2	-2.989	U2	2.7134		
Up	-1	Up	-1.9	Up	n/a	Up	4.126		
Down	-1	Down	n/a	Down	n/a	Down	-2.21		
Left	-1	Left	n/a	Left	-2.21	Left	-3.588		
Right	-1	Right	n/a	Right	-2.21	Right	-1.108		
(2,3)				(1,2)					
U1	6.02	U2	6.5708	U2	-2.471				
Up	0.1	Up	n/a	Up	2.81				
Down	0.1	Down	n/a	Down	-2.21				
Left	7.8	Left	8.412	Left	-3.19				
Right	-1	Right	n/a	Right	-0.71				