HW1

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1.2) What's the relationship between BFS, UCS and A*.

UCS is the special case of A* with the evaluation function

$$f(i) = g(i) + h(i)$$

where the heuristic function $h(i) = 0$.BFS is the special case of A* that the cost function $g(i)$ and the heuristic function $h(i)$ are equal to zero and expand all nodes at the same level.

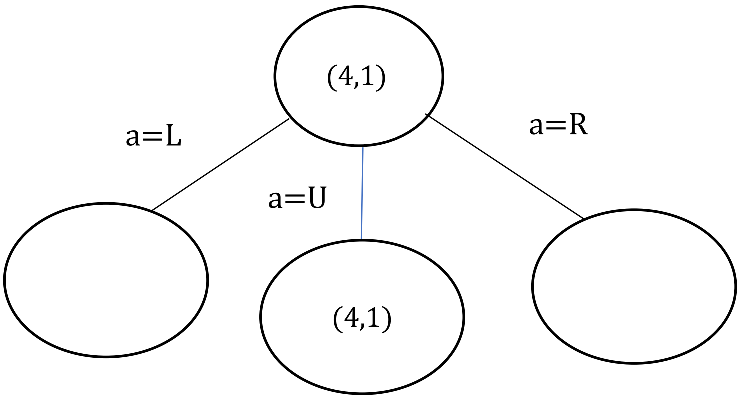
1.3) What's the relationship between DFS, Greedy and A*.

Greedy is the special case of A* with the evaluation function

$$f(i) = g(i) + h(i)$$

where the cost function $g(i) = 0$.DFS is the special case of A* that the cost function $g(i)$ and the heuristic function $h(i)$ are equal to zero and expand the deepest node in the current frontier.

2.1) Assume the initial action is "up" and the robot runs LRTA* to find the goal. Plot the search tree, H table and record table in step 1 ~ 3?



c(s,a,s')=10

H[s'=(4,1)]=2

s'=(4,1)←[s=(4,1),a=U]

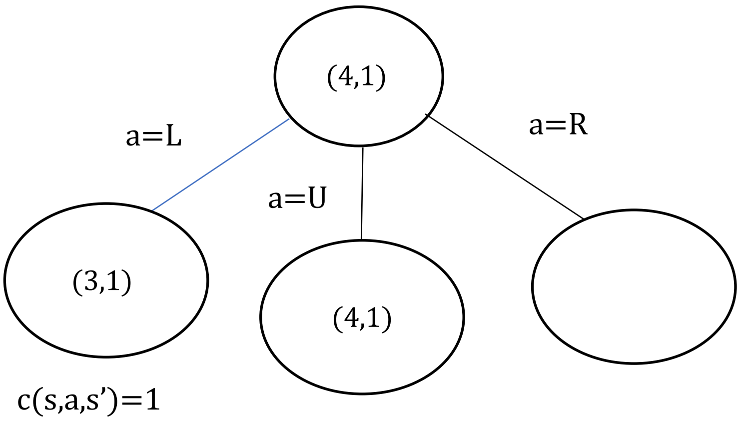
$$\begin{cases} b = L \rightarrow undefined, h[s = (4,1)] = 2 \\ b = U \rightarrow H[s = (4,1)] = 2 + 10 \\ b = R \rightarrow undefined, h[s = (4,1)] = 2 \end{cases}$$

H[s=(4,1)]←2

a←L

s←s'=(4,1)

$$\begin{cases} b = L \rightarrow undefined, h[s' = (4,1)] = 2 \\ b = U \rightarrow h[s' = (4,1)] = 12 \\ b = R \rightarrow undefined, h[s' = (4,1)] = 2 \end{cases}$$



H[s'=(3,1)]=3

s'=(3,1)⟵[s=(4,1),a=L]

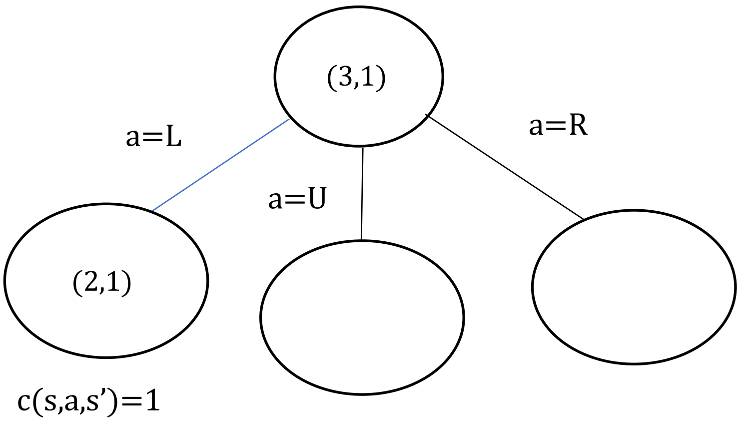
$$\begin{cases} b = L \rightarrow H[s = (3,1)] = 1 + 3 \\ b = U \rightarrow H[s = (4,1)] = 2 + 10 \\ b = R \rightarrow undefined, h[s = (4,1)] = 2 \end{cases}$$

H[s=(3,1)]⟵3

a⟵R

s⟵s'=(3,1)

$$\begin{cases} b = L \rightarrow undefined, h[s' = (3,1)] = 3 \\ b = U \rightarrow undefined, h[s' = (3,1)] = 3 \\ b = R \rightarrow undefined, h[s' = (3,1)] = 3 \end{cases}$$



H[s'=(2,1)]=4

s'=(2,1)⟵[s=(3,1),a=L]

$$\begin{cases} b = L \rightarrow H[s = (2,1)] = 1 + 4 \\ b = U \rightarrow undefined, h[s = (3,1)] = 3 \\ b = R \rightarrow undefined, h[s = (3,1)] = 3 \end{cases}$$

H[s=(2,1)]⟵4

a⟵L

s←s'=(2,1)

$$\begin{cases} b = L \rightarrow undefined, h[s' = (2,1)] = 4 \\ b = U \rightarrow undefined, h[s' = (2,1)] = 4 \\ b = R \rightarrow undefined, h[s' = (2,1)] = 4 \end{cases}$$

2.2) Explain what's the similar and different properities between A* and LRTA*?

A* and LRTA*'s evaluation function are both considered by the cost function and the heuristic function. But when we use A*, we have already knew the cost of all nodes and then we can choose the smallest one however when we use LRTA*, the robot has to go to the next position and record the cost, so it may not be the best way to the goal at the first time.

3.1) Please find 5 features of evaluation function which leads to win the game and explain why they are good features.

f1:the decresed HP of enemy team

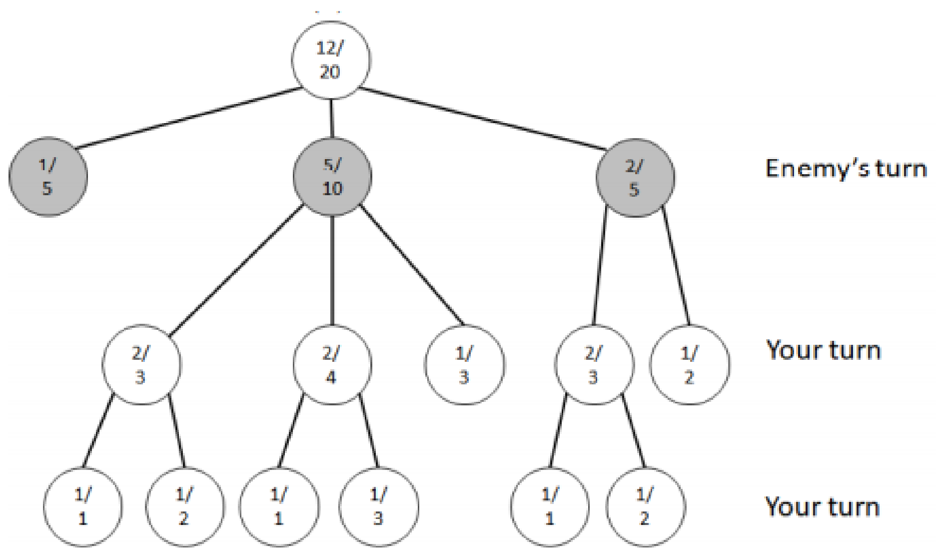
f2:the Mana of our team

f3:the speed of our team's characters

f4:the damage of our team's characters' skill

f5:the cover surface of our team's characters' attack and skill

When f1 getting higher then we are getting closer to win. And f2 can decide how many skills that our team can use in a game. In f3, if the speed of our team is faster then we will have a chance to make enemy team's characters' go to zero and can't do any action. f4, the more damage of the skill the more HP of enemy team will decrease. Also, the cover surface of the skill can decide the number of the character that the skill will hit.



(b) MCTS of Tactics Core

3.2) Please plot 4 steps (e.g., selection, expansion, simulation and backpropagation) of MCTS if the simulation outcome for you is win and no exploration in the selection step.

In figure(b), the first step selection, we always choose the maximum probability then we have 12/20→5/10→2/3→1/1.The second step expansion then we have 12/20→5/10→2/3→1/1→0/0.The third step simulation, we know that our team will win then we have 12/20→5/10→2/3→1/1→1/1.The forth step backpropagation we have 13/21→5/11→3/4→2/2.

3.3) Please plot 4 steps (e.g., selection, expansion, simulation and backpropagation) of MCTS if the simulation outcome for you is lose and no exploration in the selection step.

In figure(b), the first step selection, we always choose the maximum probability then we have 12/20→5/10→2/3→1/1.The second step expansion then we have 12/20→5/10→2/3→1/1→0/0.The third step simulation, we know that our team will lose then we have 12/20→5/10→2/3→1/1→0/1.The forth step backpropagation we have 12/21→6/11→2/4→1/2.