小班讨论一

Readings: AIMA Chapters 1-3

讨论要求：每班分成学习小组，每组 4-5 人，请课代表安排好，每组选 1 题，需要制作 ppt 进行课堂讲解和讨论，每组选题，不能重复。每组讨论时间 10 分钟，组内每个同学都要发表观点或讲解自己的解答。

1. Rich and Knight defined AI as “the study of how to make computers do things at which, at the moment, people are better”. Can you name a computer system that does things at which people are not doing better and hence the system cannot be called an AI system? Similarly, name a system that is not doing better than people and hence can qualify as an AI system.

Do you think this definition is reasonable?

2. Consider an agent which functions as a medical diagnosis system. Determine what type of agent design is the most appropriate for such an agent (simple agent, model-based agent, goal-based agent, or utility-based agent). Justify your answer.

3. Weizenbaum's ELIZA program simulates the behavior of a psychotherapist carrying out a conversation with a patient. It basically works by ending keywords in the user's input so as to the certain rules based on the keywords. Which AI definition does ELIZA think in? (Thinking humanly? Acting humanly? Thinking rationally? Acting rationally?) Discuss how an ELIZA-like system will behave, if it is modeled according to each of the four agent types, namely, "simple agent", "model-based agent agent", "goal-based agent", and "utility-based agent".

4. Consider the vacuum world problem with the state space shown in Figure 1. With the state numbers assigned in Figure 4.9 (page 134) of AIMA, let the initial state be state 1 and the goal state be either state 7 or state 8. Assume that the order of expansion of actions is S, R, L.

(a) Give a trace of the breadth-first search algorithm in the style of Figure 3.12 of AIMA (page 82). That is, show the search tree at each stage (all repeated states are eliminated).

(b) Give a similar trace of the depth-first search algorithm.

(c) Which of these two search algorithms is better for this problem? Why? Is one search

strategy always better than the other in general?

(d) Give similar traces of breadth-first search and depth-first search when the order of expansion of the actions is R, L, S.

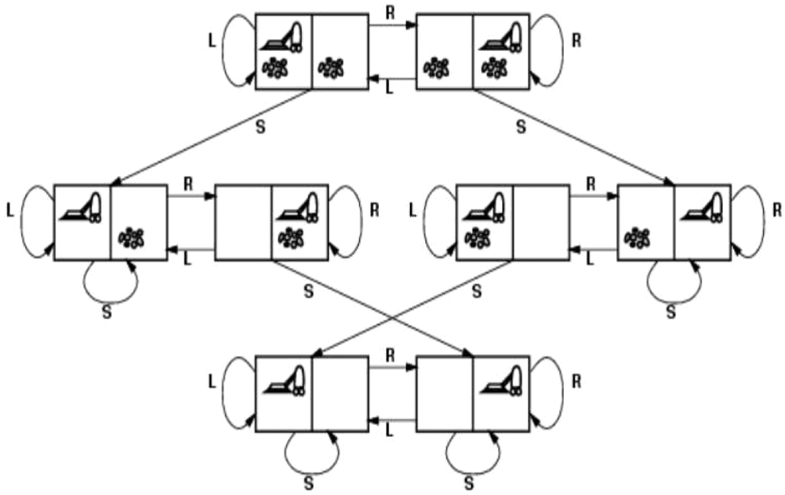

Figure 1: The state space for the vacuum world.

5. Sorting as Searching. We can sort a list of objects using only the operation of swapping two objects in the list. With this in mind, can you cast the sorting problem as a searching problem?

Draw the state space when sorting the list of numbers (2,3,1) in ascending order. What is the minimum number of swaps required?

Is the state space fully observable? Deterministic? Episodic? Static? Discrete? Justify your answers when necessary.

6. Consider the graph shown in Figure 2. Let S be the initial state and G be the goal state.

The cost of each action is as indicated.

(a) Give a trace of uniform-cost search.

(b) When A generates G which is the goal with a path cost of 11, why doesn’t the algorithm halt and return the search result since the goal has been found? With your observation, discuss how uniform-cost search ensures that the shortest path solution is selected.

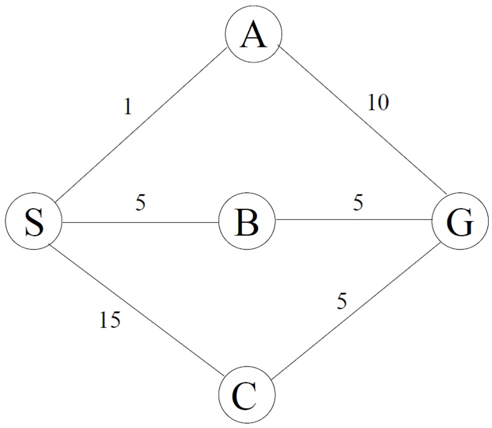

Figure 2: Graph of routes between S and G.

7. Assume that we have the following initial state and goal state for the 8-puzzle game. We will use h1 defined as "the number of misplaced tiles" to evaluate each state.

1	2	8
	4	3
7	6	5

initial state

1	2	3
8		4
7	6	5

goal state

(a) Apply the hill-climbing search algorithm in Figure 4.2 (reproduced below). Can the algorithm reach the goal state?

```
function HILL-CLIMBING(problem) returns a state that is a local maximum
   current ← MAKE-NODE(INITIAL-STATE[problem])
   loop do
      neighbor ← a highest-valued successor of current
      if VALUE[neighbor] ≤ VALUE[current] then return STATE[current]
      current ← neighbor
   end
```

(b) Identify a sequence of actions leading from the initial state to the goal state. Is it possible for simulated annealing to find such a solution?