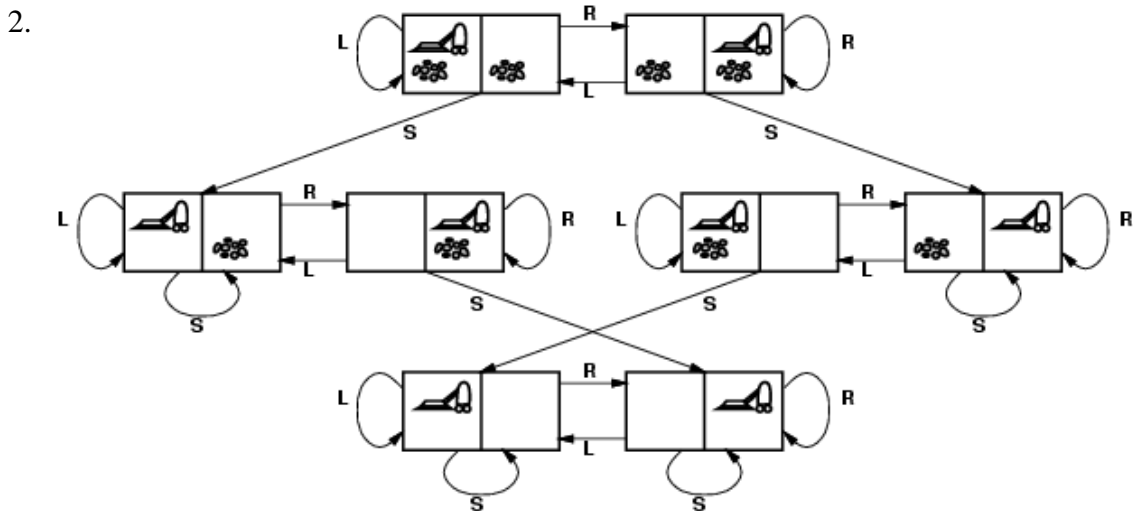


CS3243 Foundations of Artificial Intelligence (2005/2006 Semester 2)
Tutorial 2

1. The Missionaries and Cannibals problem is usually stated as follows (refer to page 90 of the textbook). Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side, without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.

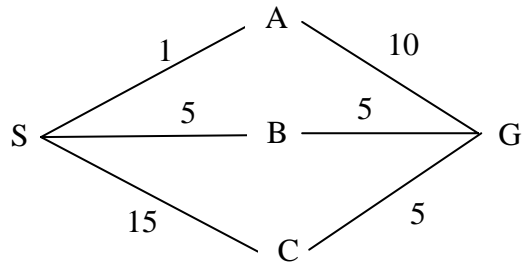
Give the representation of a state in this problem and define its actions (ignoring the possibility of illegal states).



e
Refer to Figure 3.3 (reproduced above) for the vacuum world problem, making use of the state number given in Figure 3.20. 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 3.10. 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.

3. Describe a state space in which iterative deepening search performs much worse than depth-first search.
4. Consider the following route-finding problem:



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.