

ICS171
Fall 2006
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Homework-set 1
(Due Thursday, 10/5)

Reading: Russel and Norvig chapters 1,2,3.

1. Write a paragraph answering the questions in exercise 1.11.
2. Do Exercise 3.7 on page 90. Remember, you don't have to find the solutions.
3. My friend, Tom, claims to be a descendant of Paul Revere. Which would be an easier way to verify Tom's claim?
 - (a) By showing that Revere is one of Tom's ancestors.
 - (b) By showing that Tom is one of Revere's descendants.
4. Three missionaries and three cannibals come to a river. There is a boat on their side of the river that can be used by either one or two persons. How should they use this boat to cross the river in such a way that cannibals never outnumber the missionaries on either side of the river.
 - (a) formulate the problem precisely as a a state space using variables (as if you are using an array in a program). You should make only those distinctions necessary to ensure valid solution. Determine how many states are in state space. Draw a diagram of the complete state space.
 - (b) Describe the set of operators using if-then rules.
 - (c) Suggest a greedy algorithm to compute a solution. Show a trace of your algorithm and, if unsuccessful, discuss why it failed. The trace should be described by specifying the sequence of nodes visited, each labeled by the value of the cost function being used.
 - (d) Describe a depth-first search algorithm and show a trace leading to a solution. The depth-first algorithm should be described in terms of the set of nodes (or states) reachable from a given node, a

criteria to decide which of the reachable nodes should be expanded and a criteria to decide that a goal state was reached. The trace should be described by specifying the search tree in which nodes correspond to states. The tree should be traversed from left to right.

5. Consider a sliding block puzzle with the following initial configuration:

| B | B | B | W | W | W | E |

There are three black tiles (B), three white tiles (W), and an empty cell (E). The puzzle has the following moves:

- A tile may move to an adjacent empty cell with unit cost.
- A tile may hop over at most two other tiles into an empty cell with a cost equal to the number of tiles hopped over.

The goal of the puzzle is to have all of the white tiles to the left of all of the black tiles (without regard to the position of the blank cell).

- (a) Is the search graph a tree? (Does it have cycles of length 3 or more?) If so, give an example.
- (b) Describe the first 10 nodes expanded by BFS in the order they are expanded.