CS 3600 – Introduction to Intelligent Systems

Uninformed Search

1. Missionaries and Cannibals.

Missionaries and Cannibals is a problem in which 3 missionaries and 3 cannibals want to cross from the left bank of a river to the right bank of the river. There is a boat on the left bank, but it only carries at most two people at a time (and can never cross with zero people). If cannibals ever outnumber missionaries on either bank, the cannibals will eat the missionaries.

A state can be represented by a triple, (*m c b*), where *m* is the number of missionaries on the left, *c* is the number of cannibals on the left, and *b* indicates whether the boat is on the left bank or right bank. For example, the initial state is (3 3 L) and the goal state is (0 0 R).

Operators are:

- MM: 2 missionaries cross the river
- CC: 2 cannibals cross the river
- MC: 1 missionary and 1 cannibal cross the river
- M: 1 missionary crosses the river
- C: 1 cannibal crosses the river

Draw a diagram showing all the legal states and transitions from states corresponding to all **legal** operations. See Figure 3.3 in Russell & Norvig (p. 65) for an example of what your diagram should look like.

2. Answer the following question.

Computers are able to solve this problem easily. Why do humans have a hard time with this problem at first? We know that humans and computers think differently than each other. What can we infer from the state space in problem 1 about why this problem seems hard for humans.

3. Breadth-first search

Solve the Missionaries and Cannibals problem by implementing the BFS algorithm given in class. Implement the BFS algorithm to show the open list and closed list at every iteration of the algorithm until the goal is visited. Use the format below. I have given the first two iterations.

Open: (3 3 L)
Closed: nil

Open: (3 1 R), (2 2 R), (3 2 R)
Closed: (3 3 L)

Open:
Closed:

4. Depth-first search

Same as problem 2, but use the **DFS** algorithm given in class.