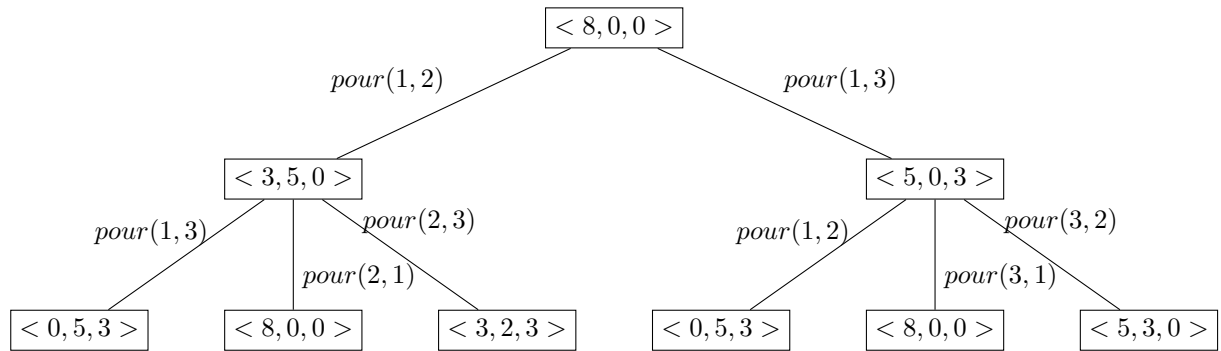# Problem Solving Review

Artificial Intelligence

1. What is a planning problem?

2. Describe open-loop and closed-loop control.

3. Write a problem formulation for a world with three unmarked pitchers – an 8 L pitcher full of water, an empty 5 L pitcher, and an empty 3 L pitcher – where an agent must reallocate the water so that one of the pitchers contains exactly 4 L of water.

4. Consider the first two levels of a BFS search tree with a start state of $< 8, 0, 0 >$ where the $expand(problem, node)$ function always enumerates child nodes by choosing actions from "left to right", that is, choosing the leftmost source pitcher to pour from, and the leftmost target pitcher to pour to.

$$< 8, 0, 0 >$$

$pour(1, 2)$ $pour(1, 3)$

$< 3, 5, 0 >$ $< 5, 0, 3 >$

$pour(1, 3)$ $pour(2, 3)$ $pour(1, 2)$ $pour(3, 2)$

$pour(2, 1)$ $pour(3, 1)$

$< 0, 5, 3 >$ $< 8, 0, 0 >$ $< 3, 2, 3 >$ $< 0, 5, 3 >$ $< 8, 0, 0 >$ $< 5, 3, 0 >$

Discuss the implications of this child node expansion order for Depth-First Search.

5. Is Breadth-First Search subject to the same problems discussed in the previous question? Why, or why not?

6. Is Breadth-First Search complete? Why, or why not?

7. Is Depth-First Search complete? Why, or why not?

8. What is the simplest way to modify Depth-First Search so that it does not descend an infinite path?

9. Discuss the most important implication of modifying Depth-First Search so that it does not descend an infinite path.

10. Describe an algorithm that uses Depth-First Search but is complete.

11. What is the primary tradeoff between Bread-First Search and Depth-First Search?