CSC 317: Project 4

Solving Puzzles – II

The Pitchers Puzzle

Total: 100 points

We will not have the time to build automated solvers as alternatives to the Human Player. So the last project for this semester will be to just add a new puzzle to the suite. In this puzzle you have a list of n pitchers, with known capacities, c_1, c_2, ... c_n, of holding water in gallons. You have a faucet that can be used as often and as much as the player needs. The goal is to measure exactly g gallons of water, using nothing other than these pitchers. Suppose the current amounts of water that these pitchers hold is w_1, w_2, ... w_n,. These numbers are assumed to be 0 initially. The puzzle is solved as soon as $w_i = g$ for any i. A player can perform the following operations:

- **Fill pitcher *i*** (from the faucet). The precondition of this operation is: $c_i > w_i \geq 0$. The effect is: $w_i = c_i$.
- **Empty pitcher *i***. The precondition of this operation is: $c_i \geq w_i > 0$. The effect is: $w_i = 0$.
- **Pour pitcher *i* to pitcher *j***. The precondition of this operation is: ($c_i \geq w_i > 0$) and ($c_j > w_j \geq 0$). In words, pitcher i must have some water to pour, and pitcher j must have some unused capacity to receive it. The (partial) effect is: ($w_i = 0$) or ($w_j = c_j$) or both. In words, the pour operation must continue until pitcher i becomes empty (and its content is added to pitcher j's content), **or** pitcher j becomes full (and pitcher i retains the remainder), *whichever occurs first*. They may occur simultaneously.

A Sample Run

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Select the puzzle to solve:
   1. Pitchers
   2. Eight puzzle
Your selection: 1

Enter the number of pitchers: 3
Enter the capacities of the 3 pitchers (gallons): 2, 5, 10
Enter the goal (gallons): 1

Current configuration: [0, 0, 0]
Please select your next move from the following choices:
   1. Fill pitcher 1
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   2. Fill pitcher 2
   3. Fill pitcher 3
Your selection: 2

Current configuration: [0, 5, 0]
Please select your next move from the following choices:
   1. Fill pitcher 1
   2. Fill pitcher 3
   3. Empty pitcher 2
   4. Pour pitcher 2 to 1
   5. Pour pitcher 2 to 3
Your selection: 4

Current configuration: [2, 3, 0]
Please select your next move from the following choices:
   1. Fill pitcher 2
   2. Fill pitcher 3
   3. Empty pitcher 1
   4. Empty pitcher 2
   5. Pour pitcher 1 to 2
   6. Pour pitcher 1 to 3
   7. Pour pitcher 2 to 3
Your selection: 3

Current configuration: [0, 3, 0]
Please select your next move from the following choices:
   1. Fill pitcher 1
   2. Fill pitcher 2
   3. Fill pitcher 3
   4. Empty pitcher 2
   5. Pour pitcher 2 to 1
   6. Pour pitcher 2 to 3
Your selection: 5

Current configuration: [2, 1, 0]
Great! You have reached the goal in 4 moves. Bye.
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What to submit

Submit the following 3 files (**all required separately**) on Canvas:

1. A .pdf file showing the UML class diagram for this project.
2. A .zip file containing the source code (.java files, possibly organized in subdirectory structure).
3. Runnable .jar file of the project. I should be able to run the .jar from command line like so:
   `java –jar P4.jar`