

# CS 461 – ARTIFICIAL INTELLIGENCE

## HOMEWORK #1 (5% OR 10 POINTS)

Assigned: Mon 18 Feb 2019

Due: Mon 4 Mar 2019 \*\* 2 pm \*\*

You can do this homework in groups of five (or less). Your group for this homework may simply coincide with your term project group. In any case, do not forget to indicate clearly the people who are submitting this homework (i.e., write at most five names on the submission).

You must submit your entire homework (i.e., including all the code written by your group) in **hard copy** (just a single submission per group) to our TA Miray Aysen, a graduate student in CS Department. Any programming language can be used as long as you have it available in your own portable computer.

Our TA will soon send you a note explaining the mechanics of submissions.

Any of the group members should be prepared to give a demo (individually and using his/her own computer) when requested to do so by the TA.

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### PROBLEM

Consider the following puzzle:

*You have two jugs. One holds 7 liters of water when completely full, the other holds 5 liters when completely full. You have an unlimited source of water to fill either or both jugs, and you may do so as often as you like, but there are no markings on the jugs, so if you fill a jug the only way to know how much water you've put in is if you fill it to the top. In addition, you have amazing accuracy in pouring water from one jug to another and never lose a drop. When you do choose to pour water from one jug to another you must keep pouring until either the receiving jug is full or the source jug is emptied of water. You can also always choose to fully empty either jug.*

**QUESTION 1:** *Can you get 1 liter of water in one of the jugs?*

**QUESTION 2:** *Can you get 3 liters of water in one of the jugs?*

a. Formulate this puzzle as state space search. (This part -- that is, part a -- is for you to ponder about. Your answers should appear as comments in the beginning of your code.)

- What are the states?
- What are the initial and goal states?
- What are the operators?
- What is the branching factor?

b. Run your search program (see presently) and let it print a path from the initial state to the goal state.

You must use **Depth First Search** to answer QUESTION 1. You must use **Breadth First Search** for QUESTION 2. (Just implement, in a straightforward manner, the pseudocode given in Winston, chap. 4.) You must check for repeated states.

Your program should have a simple control for 'single stepping' (tracing) so that you and the TA can inspect the intermediate stages of the problem-solving process in an incremental fashion. Needless to say, this is also useful for debugging your program during the development stage.

**N.B. MAKE SURE THAT ANYTHING YOU SUBMIT IS MACHINE-GENERATED. IF THERE IS A HANDWRITTEN ADDITION OR CORRECTION ON A PRINTOUT, YOU'LL DEFINITELY LOSE POINTS.**

**LATE POLICY:** Late submissions will first have 2 points deducted categorically. Then they'll have 1 point deducted for every late day.