CS 461 – ARTIFICIAL INTELLIGENCE

HOMEWORK #1 (5%)

Assigned: Thu Sep 28, 2017

Due: Thu Oct 12, 2017 ** 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 individuals who are submitting this homework (i.e., write at most five names).

You must email your entire homework (just a single submission per group) to our TA (Caner Mercan, PhD student in CS Department).

'Entire' usually means: complete program code + required outputs + accompanying explanations. (Our TA will soon send you a brief note explaining the mechanics of submissions. He will most probably ask you to also submit a hardcopy of your homework, by the way.)

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

PROBLEM

Consider the following puzzle:

> You have two jugs. One holds 10 liters of water when completely full, the other holds 6 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. Can you get 8 liters of water in the larger jug?
>
> a. Formulate this problem as a state space search.
>
> - What are the states?
> - What are the initial and goal states?
> - What are the operators?
> - What is the branching factor?
>
> b. Write a simple graphics program to display (draw) the complete state space for this problem.

c. Run your search program (cf. below) and let it highlight a path from the initial state to the goal state in the picture drawn in part b.

Pick <u>one of</u> Depth First Search or Breadth First Search or Nondeterministic Search for searching your state space. Then solve the puzzle using that search strategy. You must check for repeated states but the routine doing that need not be <u>efficient</u>. On the other hand, as Prof. Vladimir Lifschitz says, "<u>correct</u> reasoning is our business."

Your program should have a simple control for 'single stepping' 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. IF OUR TA ASKS YOU TO SUBMIT HARDCOPIES TOO, MAKE SURE THAT ANYTHING YOU SUBMIT IS MACHINE-GENERATED. THUS, IF THERE IS A HANDWRITTEN ADDITION OR CORRECTION ON A PRINTOUT, YOU'LL DEFINITELY LOSE POINTS. THIS INCLUDES NAMES OF GROUP MEMBERS.

LATE POLICY: Late submissions will first have 0.5% deducted categorically. Then they'll have 0.5% deducted for every late day.

For instance, if you submit this homework on Sat Oct 15 (before midnight), you'll have a further 1.5% deducted from whatever grade you receive out of 5%. The calculation is as follows: 0.5 for missing the 2 pm deadline on the due date (Thu) + 0.5 for not submitting on the same day + 0.5 for not submitting on the next day (Fri).