



CPSC 3750 –Artificial Intelligence – Spring 2024

Assignment 1 [200 points]

Due on February 2nd, 2024

Instructions

- Your written part should be uploaded to Moodle.
- Your programming part should run on the department computer platforms, that's in your course account.
- Your programming part should be uploaded to Moodle, including your source code, Makefile, and README file.

Written Part

1. [20 points]

For each of the following activities, give a description of the task (i.e., performance measure), the environment, the actions, and the sensors, and characterize the environment in terms of *fully observable* vs. *partially observable*, *single agent* vs. *multiagent*, *deterministic* vs. *stochastic*, *static* vs. *dynamic*, *discrete* vs. *continuous*.

- playing soccer
- bidding on an item at an auction

12 gallon
- 8 gallon
4 gallon

Fill 8
Fill 12 with 8
Fill 8
2
Fill remaining 12 with 8
8 yet 4 gallon remain
fill 3 with 4 remaining 8
8 now has 1 gallon

2. [20 points]

Give a complete problem formulation for each of the following:

- Using only four colors, you have to color a planar map in such a way that no two adjacent regions have the same color.
- You have three jugs measuring 12 gallons, 8 gallons and 3 gallons, and a water faucet. You can fill the jug up, empty it out from one to another or onto the ground. You need to measure out exactly one gallon.

3. [60 points]

Consider the problem of finding a path in the grid shown below from the position ¹S to the position G. The agent can move on the grid horizontally and vertically, one square at a time (each step has a cost of one). No step may be made into a forbidden crossed area.

L	27	26	28				
U	24	25	29	30			
L	23	22	G	31			
U	20	21					
U	19		2	1	3		
U	17	18		S	4	5	
L	15	14	11	10	7	6	
D	16	13	12	9	8		

- (a) On the grid, number the nodes in the order in which they are traversed in a depth-first search from S to G, given that the order of the operators you will test is: up, left, right, then down.
- (b) Number the nodes in order in which they are traversed in a breadth-first search from S to G, given that the order of the operators you will test is: up, left, right, then down.
- (c) Number the nodes in order in which they are traversed in an iterative deepening depth-first search from S to G, given that the order of the operators you will test is: up, left, right, then down. At what depth the solution is reached?

maybe DFS?
assuming it's directed

Programming Part

1. **[100 points]** The missionaries and cannibals problem is usually stated as follows. Three missionaries and three cannibals are on one side of a river, along with a boat that can hold one or two people. Find a way to get everyone to the other side without ever leaving a group of missionaries in one place outnumbered by the cannibals in that place.
 - Formulate the problem precisely in terms of search, that's state space, successor function or actions, start state and goal state, making only those distinctions necessary to ensure a valid solution. What is the best representation (abstraction) of a state?
 - Implement and solve the problem optimally using an appropriate search algorithm. Is it a good idea to check for repeated states?