COMS 572: Homework #2

September 7, 2018 by 17:00pm

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Problem 1

(20 pts.) Give a complete problem formulation for each of the following. Choose a formulation that is precise enough to be implemented.

a. Using only four colors, you have to color a planar map in such a way that no two adjacent regions have the same color.

Answer:

States: Planar map with regions with or wihout colors.

Initial State: Planar map with no regions colored.

Actions: Choose an uncolored region and color it with one of the four colors and make it different from all adjacent regions.

Goal Test: All regions of the map are colored and no two adjacent regions have the same color.

Path Cost: 1 per action.

d. You have three jugs, measuring 12 gallons, 8 gallons, and 3 gallons, and a water faucet. You can fill the jugs up or empty them out from one to another or onto the ground. You need to measure out exactly one gallon.

Answer:

States: 3 jugs with water, say [i, j, k] (in gallons)

Initial state: No water in all jugs, [0, 0, 0]

Actions:

1. Fill one of the jugs, [12, j, k] or [i, 8, k] or [i, j, 3];

2. Empty one of them, [0, j, k] or [i, 0, k] or [i, j, 0];

3. For any two jugs A and B, with current water X gallons in A and Y gallons in B, pour water from jug B to jug A; this makes jug A to have water min(X+Y, capacity of jug A) gallons, and jug B to have water (X + Y - min(X+Y, capacity of jug A)).

Goal test: The amount of water in 3 jugs [i, j, k], where at least one of i, j, k is 1.

Path Cost: 1 per action.