CISC 481 Homework 1

February 28, 2022

1. (5 pts) From exercise 2.9 in the book: Consider a simple thermostat that turns on a furnace when the temperature is at least 3 degrees below the setting, and turns off a furnace when the temperature is at least 3 degrees above the setting. Is a thermostat an instance of a simple reflex agent, a model-based reflex agent, or a goal-based agent? Briefly justify your answer.
2. (10 pts, 5 ea) From exercise 3.2 in the book: Give a complete problem formulation (states, initial state, goal states, actions, etc as described in secion 3.1.1 of the book) for each of the following problems. Choose a formulation that is precise enough to be implemented.
   - There is an $n \times n$ grid of squares, each square initially being either unpainted floor or a bottomless pit. You start standing on an unpainted floor square, and can either paint the square under you or move onto an adjacent unpainted floor square. You want the whole floor painted.
   - A container ship is in port, loaded high with containers. There 13 rows of containers, each 13 containers wide and 5 containers tall. You control a crane that can move to any location above the ship, pick up the container under it, and move it onto the dock. You want the ship unloaded.
3. (15 pts, 5 ea) After a football game, you are trying to get from South Campus back up to the Laird Campus with your pet golden fox, your pet blue hen, and a bushel of blue corn. The UDel bus rules only allow you to carry one pet with you at a time, and the bus drivers won't allow you to bring anything else with you when you carry that bushel basket of corn. Sad to say, while you love your pets, your fox would, if left to its own devices, devour your blue hen, and your hen would devour your blue corn if left alone with it. Fortunately, you now know several blind search methods to calculate a sequence of steps that will get all four of you across campus undigested.
   - Formulate this as a formal search problem. What are the states, actions, goal test, path costs, etc.?
   - Of the uninformed search strategies in Chapter 3, which would you recommend to find a safe plan in the fewest number of bus trips, and why?
   - Trace the search tree produced by the method you named above, assuming a graph search implementation (prune repeated states).