

COSC 370 Final Exam Review  
Spring 2011

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- 1.) Define the Turing Test.
- 2.) What do we mean by a rational agent?
- 3.) For the following tasks, note if they can be done at present or not (with AI) and justify:
  - a. Play a decent game of table tennis
  - b. Buy a week's worth of groceries at Giant
  - c. Discover and prove a new mathematical theorem
- 4.) Give the PEAS, including a full accounting of the environment for a chess playing agent.
- 5.) Using pseudo-code give an example of a simple reflex agent for a 2x2 vacuum cleaner
- 6.) What's the difference between a goal-based agent and a utility-based agent?
- 7.) What's the difference between online and offline search?
- 8.) Give the problem formulation (goal, states, action, solution) for the problem of attempting to get from Arad, Romania to Bucharest, Romania.
- 9.) What are the four problem types in agent design? Define them.
- 10.) Give a single-state, conformant and contingency agent design for the vacuum world problem
- 11.) Give the state space description for the Arad to Bucharest problem.
- 12.) Give a tree expansion for a simple 3-puzzle where blank is in the upper left corner, 2 is in the upper right, 1 is in the bottom right and 3 is in the bottom left. What tree search technique is best in this situation? Why?
- 13.) Describe depth limited and iterative deepening search. Include all of the properties discussed in class.
- 14.) Design an A\* algorithm for a robot that has to navigate from one side of a room to the other, avoiding any obstacles along the way.

- 15.) Would A\* or Greedy search be better for the following problem: I have a weighted tree of finite depth and width and I want to find the path from a particular vertex  $v$  that has the largest cost. Note that the algorithm would return the destination vertex in this case.
- 16.) What is required for a heuristic to be admissible? What is required for a heuristic to dominate another heuristic?
- 17.) Describe a simulated annealing solution to the classic Sudoku problem.
- 18.) Describe a hill-climbing solution to the n-queens problem.
- 19.) Give an example of a constraint satisfaction problem and how it is solved.
- 20.) Without relying on pseudocode (or any other code snippets), describe the minimax approach to adversarial search.
- 21.) In pseudocode, describe alpha-beta pruning.
- 22.) What alterations would need to be made to the minimax approach if we introduce an element of chance (coin flip, die roll, etc.)?
- 23.) Why would we need a cutoff test for alpha-beta pruning or minimax?
- 24.) Give an example of a deterministic, perfect information game. Give an example of an imperfect information, deterministic game.
- 25.) In the classic Wumpus World, the agent moves north, feels a breeze, moves south, moves east and smells something. What do I know about space (2, 2) assuming that the agent started in (1,1) (bottom left corner)?
- 26.) Give an instance in the classic Wumpus World problem where the agent would have to take a chance of dying in order to move.
- 27.) In the classic Wumpus World, our agent starts in (1,1) not perceive anything, and moves north and smells something. Consider all possible models for the snapshot of Wumpus World that includes (1,1), (1,2), (1,3), (2, 1) and (2,2). Circle the models that would be valid for the Wumpus World KB.
- 28.) Describe forward chaining and backward chaining noting why we would typically use BC over FC.
- 29.) Convert the following sentence into CNF:

$$((a \vee \neg b) \wedge (\neg c \vee d)) \Rightarrow (e \wedge \neg f)$$

- 30.) Define a vocabulary for the following sentences and convert those sentences into first-order logic using that vocabulary.
- Some students took French in Spring 2010.
  - Every student who takes French passes it.
  - Only one student took Greek in Fall 2010.
  - The best score in Greek is always higher than the best score in French.
  - Alan, who took French, but not Greek, is awesome.
- 31.) Give the regular expression for the language of all strings that contain a substring aba or bab with  $\Sigma = \{a, b\}$ .
- 32.) What are the four questions for a learning element? Create a learning element for an agent that keeps falling into pits in Wumpus World.
- 33.) Construct 12 examples with 8 attributes for the question "Will I register for this class?" Construct the resulting decision tree.
- 34.) Draw the McCulloch-Pitts neural unit and describe each of the parts of that model. Give an simple example of a neural net using this unit, being sure to describe how the network functions.
- 35.) Describe a feed-forward network. Describe a self-organizing map.