Midterm Study Guide

Midterm Time and Place:
- Thursday, March 5, 1:10 – 2:25pm
- Maginnes 102 *(our usual room)*

Format:
The test will be held in class. You can expect the following types of questions: true/false, short answer, and smaller versions of homework problems. It will be closed book and closed notes. However, you may bring one 8 ½ x 11" "cheat sheet" with handwritten notes on one-side only. Also, all calculators, PDAs, portable audio players (e.g., iPods) and cell phones must be put away for the duration of the test.

Coverage:
In general, anything from the assigned reading or lecture could be on the test. In order to help you focus, I have provided a **partial list** of topics that you should know below. In some cases, I have explicitly listed topics that you do not need to know. In addition, you do not need to reproduce the pseudo-code for any algorithm, but you should be able to apply the principles of the major algorithms to a problem as we have done in class and on the homework.

- Ch. 1 – Introduction
    - rationality
    - definitions of "artificial intelligence"
    - The Turing Test
    - **you do not need to know:**
        - dates and history
- Ch. 2 - Agents
    - PEAS descriptions
        - performance measure, environment, actuators, sensors
    - properties of task environments
        - fully observable vs. partially observable, deterministic vs. stochastic vs, strategic, episodic vs. sequential, static vs. dynamic, discrete vs. continuous, single agent vs. multiagent, known vs. unknown
    - agent architectures
        - simple reflex agents, goal-based agents, utility-based agents
    - state representations
        - atomic, factored, structured
    - **you do not need to know:**
        - learning agents
- Ch. 3 – Search
    - problem description
        - initial state, actions, transition model, goal test, path cost/step cost
    - tree search
        - expanding nodes, frontier
        - branching factor
    - graph search
        - explored set
    - uninformed search strategies
        - breadth-first, depth-first, uniform cost
        - similarities and differences / benefits and tradeoffs between strategies
        - evaluation criteria
            - completeness, optimality, time complexity, space complexity

- o best first search
  - evaluation function
- o informed search
  - heuristics
  - greedy best-first, A*
  - admissible heuristics
  - similarities and differences / benefits and tradeoffs between strategies
- o **you do not need to know:**
  - depth-limited, iterative deepening or bidirectional search
  - details of proof that A* is optimal if h(n) is admissible
  - memory bounded heuristic search
  - learning heuristics from experience
- Ch. 5 - Game playing (Sect. 5.1-5.2, 5.4, 5.7-5.9)
  - o two-player zero-sum games
  - o problem description
    - initial state, actions, transition model, terminal test, utility function
  - o minimax algorithm
  - o optimal decision vs. imperfect real-time decisions
  - o evaluation function, cutoff-test
  - o **you do not need to know:**
    - alpha-beta pruning
    - forward pruning
    - details of any state-of-the-art game playing programs
- Ch. 7 – Logical Agents (Sect. 7.1-7.4, 7.5.3-7.5.4, 7.7-7.8)
  - o knowledge-based agents
    - TELL, ASK
  - o propositional logic
    - syntax and semantics
  - o entailment, models, truth tables
  - o model checking
  - o inference procedures
    - forward-chaining
    - backward-chaining
    - sound, complete
  - o **you do not need to know:**
    - details of the Wumpus world
    - circuit-based agents
- Ch. 8 – First-Order Logic
  - o syntax and semantics
    - be able to translate English sentences into logic sentences
  - o quantification
    - existential, universal
  - o domain, model, interpretation
  - o equality/inequality
    - making statements about quantity (e.g., exactly two brothers)
  - o **you do not need to know:**
    - specific axioms from the domains given in class or the book

- "Intro to Prolog Programming" Reading, Ch. 1
  - syntax
    - be able to write rules and facts in Prolog
    - translating to FOL and vice versa
  - negation as failure / closed world assumption
  - **you do not need to know:**
    - backward-chaining, depth-first search
- Ch. 9 – Inference in First-Order Logic (Sect. 9.1-9.2 only)
  - substitution, unification
    - most general unifier