Artificial Intelligence – Exam 1 Outline – Fall 2021

The exam will cover the following topics.

Introduction
- Definition of AI
- Four approaches to AI
    - Acting humanly
    - Thinking humanly
    - Thinking rationally
    - Acting rationally (approach we'll follow)
- Turing test

Intelligent Agents
- Definition of agent, percept, action, rational agent
- PEAS description of task environment
    - Performance, Environment, Actuators, Sensors
- Task environment properties
    - Fully vs. partially observable
    - Single vs. multi-agent
    - Deterministic vs. stochastic
    - Episodic vs. sequential
    - Static vs. dynamic
    - Discrete vs. continuous
    - Known vs. unknown
- Types of agents
    - Reflex
    - Model-based
    - Goal-based
    - Utility-based
    - Learning: critic, learning element, problem generator
- Wumpus world

Search
- Problem-solving agent
- Five parts of search problem
    - Initial state, actions, transition model, goal test, path (step) cost
    - Examples: vacuum world, 8-puzzle, wumpus world
- State space, search tree, path, frontier
- Tree search vs. graph search
- Performance: completeness, optimality, time and space complexity
- Branching factor
- Uninformed search (know algorithm and performance for each)
    - Breadth-first, Depth-first, Depth-limited, Iterative deepening
- Informed search (know algorithm and performance for each)

    - Greedy best-first, A*, Hill-climbing (stochastic)
- State space properties: plateau, local maximum, global maximum
- Heuristic functions
    - Admissible, dominating
    - Designing good heuristics
    - Heuristics: city-block (Manhattan), straight-line (Euclidean)
- Adversarial search
    - Game tree
    - Minimax (know algorithm and complexity)
    - Alpha-beta pruning (know algorithm)
    - Move ordering
    - Real-time games: cutoff test, state evaluator
    - Stochastic games: chance nodes, ExpectiMinimax
    - Partially-observable games
    - Games: tic-tac-toe, checkers, chess, go, backgammon, poker