Midterm Review Topics
CS 121

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1 Intelligent Agents

1.1 Agents

- Agent function
- Agent program

1.2 Rationality

- Performance measure

1.3 PEAS

- Performance measure
- Environment
- Actuators
- Sensors

1.4 Environment types

- Observable?
- Deterministic?
- Episodic?
- Static?
- Discrete?
- Single-agent?

1.5 Agent types

- Simple reflex agents
- Reflex agents with state
- Goal-based agents
- Utility-based agents
- Learning agents

2 Search

2.1 Search problems

- State space
- Initial state
- Goal test
- Successor function
- Path cost

2.2 Search components and terms

- Nodes vs states
- The `FRINGE`
- node expansion
- node generation
- branching factor
- depth of solution
- maximal path length in state space

2.3 Measuring search

- Completeness
- Optimality
- Time Complexity
- Space Complexity

3 Blind search

3.1 Breadth-first search

- FIFO
- Complete
- Optimal
- time and space = $O(b^{d+1})$

3.2 Depth-first search

- LIFO
- not complete
- not optimal
- time = $O(b^m)$
- space = $O(bm)$

3.3 Other blind search types

- Depth-limited search
- Iterative deepening search
- Bidirectional search

4 Informed search

4.1 Best-first search

- evaluation function f
- cost function g
- heuristic function h

4.2 Uniform-cost search

- $f(n) = g(n)$

4.3 Greedy best-first search

- $f(n) = h(n)$

4.4 A* search

- $f(n) = h(n) + g(n)$
- proof of completeness
- proof of optimality
- A* with consistent heuristic
- increasing f-value expansion

4.5 A* extensions

- Iterative deepening A*
- Memory bounded A*

4.6 Properties of heuristics

- admissible
- consistent
- heuristic domination
- constructing heuristics

5 Local search

- state space landscape

5.1 Types of search

- Hill-climbing search
- Stochastic hill-climbing
- First-choice hill-climbing
- Random restart hill-climbing
- Simulated annealing
- Local beam search
- Genetic algorithms

6 Constraint satisfaction problems

6.1 Formulation

- variables
- domains
- constraints

6.2 Methods

- Backtracking search
- Forward checking
- Most-constrainted variable heuristic
- Most-constraining variable heuristic
- Least-constraining value heuristic
- AC3

7 Action Planning

- STRIPS Language
- Forward Planning
- Backward Planing
- Planning Graph
- Possible Extensions to STRIPS