CMPSCI 683 Fall 2008
Prof. Victor Lesser November 11, 2008

MID-TERM EXAM (MAKEUP) --- Due on November 17, 2008

The answers to these questions should be specific and to the point; we are not looking for essays!

Taking this exam is not compulsory. If you do decide to turn in your solutions for grading, your new midterm score will be the average of your old score and the score on this exam. Caveat: If you end up doing worse on this makeup exam, your midterm score will not be affected.

This is an exam, and not a homework. Collaboration is absolutely NOT allowed.

1. Short questions (42 points, 6 Points each)

Why are these concepts important in search? (Explain their more general use in search beyond the specific instance mentioned below.) Define them, and explain why and when they lead to more efficient search. Keep it short!

a) Search contour as used in Iterative Deepening A*
b) Random Restart Hill Climbing
c) Beam (K-best) Search
d) Diversity in Genetic Search
e) Mini-Conflict in Heuristic Search
f) Value Ordering in CSP
g) Multi-level Hierarchical Search in the Blackboard

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2. More on Search (26 points)

a) (14 points) The following diagram represents a way of categorizing different search strategies. Discuss the different dimensions of the diagram and why they are important to understanding and distinguishing different search strategies.

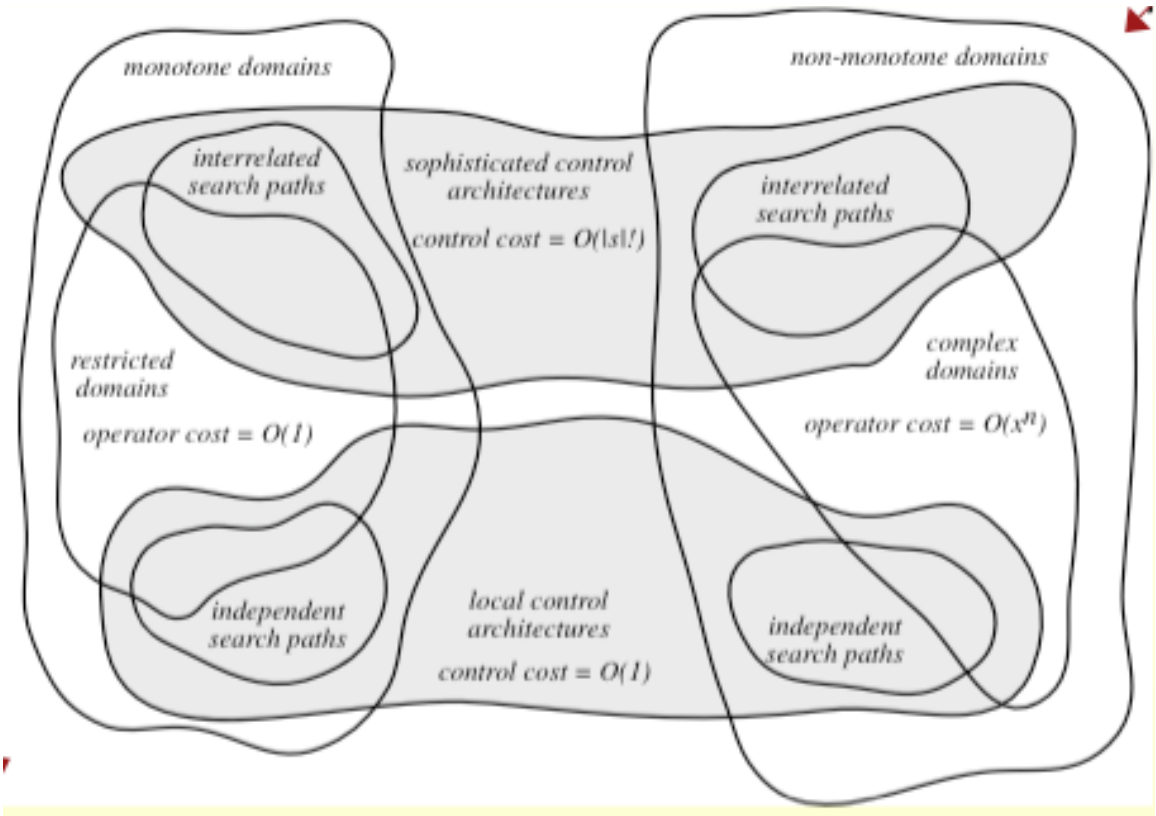

Figure 1: Taxonomy for Characterizing Search Strategies

b) (12 points) This is a question about SMA*.

Why do we need to back up the best f-value of all the successors of a node?
Why do we need to back up the f-value of a node's best-forgotten child?
How does these backups contribute to the optimality of the algorithm?

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3. Search (32 Points)

In class we discussed how there were many equivalent Bayesian networks for the same problem based on the order of nodes introduced into the network during construction. Each of these networks has potentially

different linking structures among the nodes and thus having different size CPT tables.

a. **(12 points)** Sketch out an A* search process that would compute the Bayesian network with the smallest number of CPT entries. Specifically, you should make clear in the description:

- what would be a node
- what would be an operator
- what would be a heuristic
- what type of domain knowledge would you need to know

b. **(12 points)** Sketch out how you would do the same problem with simulated annealing:

- what would be a node
- what would be an operator
- what would be a measure of progress
- would you include a random restart approach

c. **(8 points)** How would you compare and contrast the two different approaches? For example, what characteristics of the specific problem would suggest using one search strategy over another?