Week 3 Quiz: Heuristic Search

Q1 - Optimality #1

10/10 points (graded)

Consider graph search algorithms for some search space. Suppose the branching factor b is finite, the shallowest goal is at finite depth d, and step costs are finite, greater than some small positive constant, but not necessarily all equal. Check all that apply:

- [ ] Depth-First Search is optimal
- [ ] Depth-Limited Search (limit > d) is optimal
- [ ] Iterative-Deepening Search is optimal
- [ ] Breadth-First Search is optimal
- [x] Uniform-Cost Search is optimal

✔

Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

Q2 - Optimality #2

10/10 points (graded)

Consider graph search algorithms for some search space. Suppose the branching factor b is finite, the shallowest goal is at finite depth d, and step costs are finite, positive, and all identical. Check all that apply:

- [ ] Depth-First Search is optimal
- [ ] Depth-Limited Search (limit > d) is optimal
- [x] Iterative-Deepening Search is optimal
- [x] Breadth-First Search is optimal

- [x] Uniform-Cost Search is optimal

✔

Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

Q3 - Admissibility #1

10/10 points (graded)

Consider a finite search space. Suppose step costs are finite and greater than some small positive constant, but not necessarily all equal. Suppose h(n) is an admissible heuristic. Check all that apply:

- [x] h(n) never overestimates the true cost h*(n) from n to the goal
- [ ] f(n) never overestimates the true cost h*(n) from n to the goal
- [x] f(n) never overestimates the true cost g(n) + h*(n) from the root to the goal through n

✔

Submit You have used 1 of 1 attempt

✔ Correct (10/10 points)

Q4 - Admissibility #2

10/10 points (graded)

In lecture, we see an example of a heuristic for the map problem; that is, the straight line distances h_SLD(n) from n to the goal. Check all that apply to this instance of the search problem (in particular, note that no edges are less than unit cost):

- [x] h_SLD(n) is admissible
- [ ] h_SLD(n)^2 is admissible
- [x] sqrt(h_SLD(n)) is admissible
- [ ] h_SLD(n)^2 - 99 * h_SLD(n) is admissible
- [x] 0 is admissible

- [x] 0 is admissible

✔

Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

Q5 - Completeness #1

10/10 points (graded)

Consider graph search algorithms for an infinite* search space. Suppose the branching factor b is finite, the shallowest goal is at finite depth d, step costs are finite, greater than some small positive constant, but not necessarily all equal. Check all that apply:

* As an example of an infinite search space, consider the 3-dimensional integer lattice Z^3; that is, the lattice in the Euclidean space R^3 whose lattice points are ordered triples of integers. A "state" may consist of a point in space (i.e. an ordered triple in Z^3), and a "transition" may consist of moving a certain number of units in the positive or negative directions parallel to one of the coordinate axes.

- [ ] Depth-First Search is complete
- [x] Depth-Limited Search (limit > d) is complete
- [x] Iterative-Deepening Search is complete
- [x] Breadth-First Search is complete
- [x] Uniform-Cost Search is complete
- [x] A-Star Search is complete

✔

Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

Q6 - Completeness #2

10/10 points (graded)

Consider graph search algorithms for a finite search space. Suppose the branching factor b is finite, the shallowest goal is at finite depth d, step costs are finite, greater than some small positive constant, but not necessarily all equal. Check all that apply:

constant, but not necessarily all equal. Check all that apply.

- [x] Depth-First Search is complete
- [x] Depth-Limited Search (limit > d) is complete
- [x] Iterative-Deepening Search is complete
- [x] Breadth-First Search is complete
- [x] Uniform-Cost Search is complete
- [x] Greedy Best-First Search is complete
- [x] A-Star Search is complete

✔

Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

Q7 - Greedy Best-First Search #1

10/10 points (graded)

In lecture, we see an example of a heuristic for the map problem; that is, the straight line distances h_SLD(n) from n to the goal. Consider Greedy Best-First Search applied to this instance of the search problem, using the straight-line distance heuristic (in particular, note that no edges are less than unit cost). Check all that apply:

- [ ] It always manages to reach the goal in the fewest number of steps
- [ ] It always manages to reach the goal through the least costly path
- [x] At each step it tries to get as close to the goal as possible
- [ ] At each step it always gets closer to the goal

✔

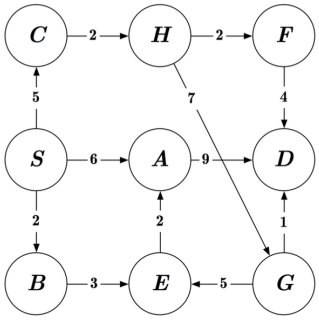
Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

Q8 - Greedy Best-First Search?

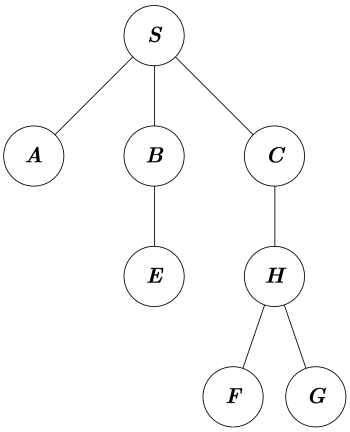
0 points possible (ungraded)

Consider the following graph. Edges between nodes may only be traversed in the direction indicated by the arrow. We will search the graph with the algorithms we learned, keeping a full explored set as we go. As usual, where an arbitrary choice has to be made, assume that nodes are visited in lexicographical order. The starting node is S and the goal node is G. The table on the right provides the value of the heuristic function for each node:



A: 5
B: 1
C: 3
D: 9
E: 4
F: 0
G: 0
H: 7

Did Greedy best first search algorithm generate this search tree? **Note that only expanded nodes are shown in this tree.**



- [x] True
- [ ] False

✔

Submit You have used 1 of 1 attempt

✔ Correct

✔ Correct

Q9 - A-Star Search #1

10/10 points (graded)

In lecture, we see an example of a heuristic for the map problem; that is, the straight line distances h_SLD(n) from n to the goal. Consider A-Star Search applied to this instance of the search problem, using the straight-line distance heuristic (in particular, note that no edges are less than unit cost). Check all that apply:

- [ ] It always manages to reach the goal in the fewest number of steps
- [x] It always manages to reach the goal through the least costly path
- [ ] None of the above

✔

Submit You have used 1 of 1 attempt

✔ Correct (10/10 points)

Q10 - A-Star Search #2

10/10 points (graded)

Consider A-Star Search on a tree of finite depth, where the branching factor b is finite, the shallowest goal is at finite depth d, step costs are finite, greater than some small positive constant, but not necessarily all equal, and the tree contains no duplicate nodes. Check all that apply. It:

- [ ] Evaluates nodes by using just the heuristic function
- [x] Evaluates nodes by using the heuristic function plus path costs
- [x] Is optimal if it has an admissible heuristic
- [x] Becomes Uniform-Cost Search if the heuristic h(n) = 0 for all n
- [ ] Becomes Uniform-Cost Search if the path cost g(n) = 0 for all n

✔

Submit You have used 1 of 2 attempts

✔ Correct (10/10 points)

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