UNIVERSITY OF SOUTH CAROLINA

HOMEWORK

UNIVERSITY OF SOUTH CAROLINA

COMPUTER SCIENCE AND ENGINEERING

CSCE 580: Artificial Intelligence

Search

Author:
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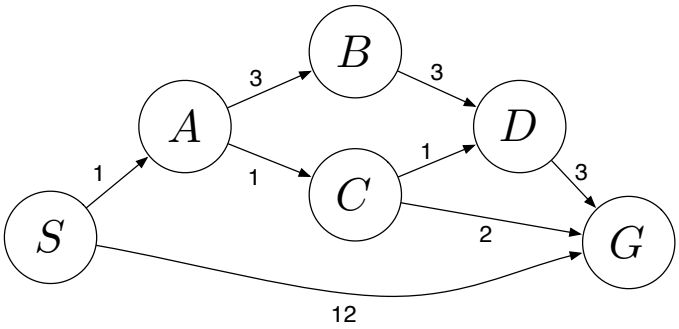
Release Date: February 6, 2019
Due Date: Tuesday Feb 5, 11:59 pm

Search



Answer the following questions about the search problem shown above. Break any ties alphabetically. For the questions that ask for a path, please give your answers in the form '$S - A - D - G$.'

1. What path would breadth-first graph search return for this search problem? (**15 points**)

   $S - G$

2. What path would uniform cost graph search return for this search problem? (**15 points**)

   $S - A - C - G$

3. What path would depth-first graph search return for this search problem? (**15 points**)

   $S - A - B - D - G$

4. What path would A* graph search, using a consistent heuristic, return for this search problem? (**15 points**)

   $S - A - C - G$

5. Consider the heuristics for this problem shown in the table below.

State	h_1	h_2
S	5	4
A	3	2
B	6	6
C	2	1
D	3	3
G	0	0

(a) Is h_1 admissible? (**10 points**) **Yes** **No**
Why?

(b) Is h_1 consistent? (**10 points**) **Yes** **No**
Why?

(c) Is h_2 admissible? (**10 points**) **Yes** **No**
Why?

(d) Is h_2 consistent? (**10 points**) **Yes** **No**
Why?

A heuristic is *admissible* if it never overestimates the cost of reaching the goal, i.e., it is optimistic. Mathematically, for all node n, $0 \leq h(n) \leq h^*(n)$, where $h^*(n)$ is the optimal cost to reach a goal from node n and $h(n)$ is the cost indicated by the heuristic to reach a goal from node n.

A heuristic is *consistent* if its estimate is always less than or equal to the estimated distance from any adjacent node to the goal, plus the cost of reaching that adjacent node. Mathematically, for every node $n1$ and each successor $n2$ of $n1$, $h(n1) - h(n2) \leq c(n1 \rightarrow n2)$, where $c(n1 \rightarrow n2)$ represent the cost of getting to $n2$ from $n1$.

(a) $h1$ overestimates the cost $S \rightarrow G$ as 5 when it is 4, so it is inadmissible. Note that only one counterexample is enough for finding out that a heuristic is not admissible.

(b) $h1$ is not consistent because $h(S) - h(A) \leq c(S \rightarrow A)$ is violated as $5 - 3 \leq 1$. Note that only one counterexample is enough for finding out that a heuristic is not consistent.

(c) $h2$ does not overestimate costs and is admissible.

(d) $h2$ is not consistent because $h(S) - h(A) \leq c(S \rightarrow A)$ is violated as $4 - 2 \leq 1$.