Started on	Saturday, 27 August 2022, 2:31 PM
State	Finished
Completed on	Sunday, 28 August 2022, 8:34 PM
Time taken	1 day 6 hours
Grade	**10.00** out of 10.00 (**100**%)

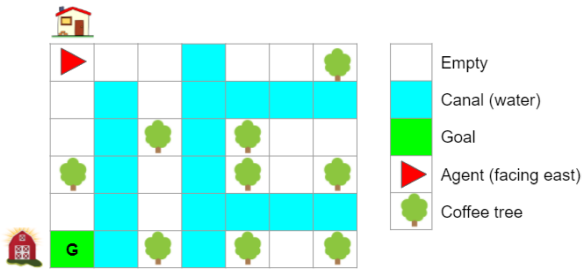
Question 1

Correct

Mark 5.00 out of 5.00

Nor is building his coffee farm. The coffee trees are scattered over his farm and there are many canals separating the plots of land. He would like to know where to build bridges so that he can take the shortest path from his house to collect coffee sherries from all coffee trees and process them in the barn. Building a bridge is very cheap, so it does not matter how many he has to build. In addition, since Nor is a human being, he would like to only move forward and turn if he needs to change his direction.

Please help Nor formulate a search problem so that he can find the shortest path. He can then use this path to build bridges wherever there are canals.



Please formulate this problem.

Q1: What must be included in the state representation? (Only select necessary items).

Item	Included?	Example values
Empty locations	Yes ✔	(1, 1), (1, 2), (2, 1)
Bridge locations	No ✔	(2, 3), (2, 5)
Canal locations	No ✔	(2, 3), (2, 5)
Agent Position	Yes ✔	(1, 1), (3, 4)
Agent Direction	Yes ✔	North, East, South, West
Goal location	No ✔	(6, 7)
Coffee Tree locations	Yes ✔	(1, 7), (6, 7)
Coffee Tree visited	Yes ✔	True (visited) or False (not visited)

Q2: There are sets of actions below. Please select the minimum set that can solve the problem:

- Turn left, Move forward, Move backward, Pick coffee, Drop
- Turn left, Turn right, Move forward
- Turn right, Move forward, Pick coffee ✔
- Move forward, Turn left, Turn right, Build a bridge, Pick coffee
- Turn left, Turn right, Move forward, Pick coffee

Mark 3.00 out of 3.00

The correct answer is: Turn right, Move forward, Pick coffee

Q3: What is the correct output of an action "Turn right" of the successor function (assume that only the agent location and direction are included in the state)?

- ((4, 2), North)->((4, 2), East) ✔
- ((4, 2), North)->((4, 1), West)
- ((4, 2), North)->((4, 3), East)
- ((4, 2), North)->((4, 2), West)

Mark 2.00 out of 2.00

The correct answer is: ((4, 2), North)->((4, 2), East)

Q4: For the items below, please specify the values for a goal test function (`None` means the item does not matter)?

- Coffee Tree visited: all true ✔
- Number of bridges built: None ✔
- Goal Position: None ✔
- Agent Position: (6, 7) ✔
- Agent Direction: None ✔

Q5: Due to the boom in infrastructure and real-estate sectors, material costs shot up by 500%. Building a bridge now costs a fortune, how would you re-formulate this?

- ☑ Canal locations are important to the state variables. ✔
- ☐ All actions will cost the same
- ☑ The cost of crossing a canal should increase. ✔

Mark 2.00 out of 2.00

The correct answer is:
- The cost of crossing a canal should increase.
- Canal locations are important to the state variables.

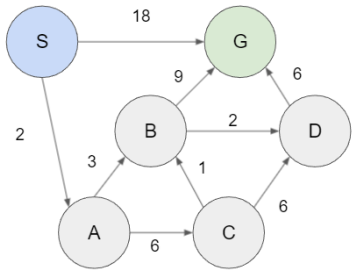
Question 2

Correct

Mark 5.00 out of 5.00

Given the state space graph and heuristic values below:

State-Space Graph:



Heuristic values:

State	h1	h2
S	7	8
A	10	4
B	7	6
C	8	12
D	5	2
G	0	0

Please answer the following questions:

Q1: What is the path that the search algorithm returns for this search problem?
Answer in the form of ***S-C-D-G*** without any space and all capital letters.

Break any ties alphabetically.

- Depth-first search:
  S-A-B-D-G ✔ ,
  with path cost:
  13 ✔
- Breadth-first search:
  S-G ✔ ,
  with path cost:
  18 ✔
- Uniform-cost search:
  S-A-B-D-G ✔ ,
  with path cost:
  13 ✔
- Greedy search using h1:
  S-G ✔ ,
  with path cost:
  18 ✔
- A* search using h1:
  S-A-B-D-G ✔ ,
  with path cost:

13

✔

Q2: Properties of the heuristic function *h1* and *h2*:

	h1	**h2**
Admissible	Yes ✔	No ✔
Consistent	Yes ✔	No ✔

Information

Please do the Feedback for Week 3.