

Post-test: Discussion questions for nine groups (one question for each group)

1. Imagine you are given two buckets (X and Y) which are not calibrated, but when the buckets are full X can hold 10 litres of kerosene and Y can hold 7 litres of kerosene. You also have a pump that can be used to fill either X or Y with kerosene and you can empty the contents of either X or Y at any time. Your goal is to get exactly 1 litre of kerosene into bucket Y.
 - a) Describe the state space representation for this problem and identify the initial state and goal state.
 - b) Identify the rules/operators which can be used to solve this problem
 - c) Apply the above rules and describe the possible solutions to this problem
 - d) Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.

2. Imagine you have three Cups (X, Y, Z) measuring 9 litres, 5 litres and 4 litres respectively when full, but they are not calibrated and a keg tap is available which can be used to fill them. You can fill the cups or empty them out from one to another or empty by pouring onto the ground. Your goal is to serve a customer with a cup of keg measuring exactly 2 litres.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.

3. Imagine you have four bottles (A, B, C and D) measuring 7 litres, 5 litres, 6 litres and 12 litres respectively when full but they are not calibrated. You can connect them to a water pump and fill the bottles or empty them out from one to another or empty by pouring onto the ground. Your goal is to use bottle A, B and C to obtain exactly 10 litres in Bottle D.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.

- e.
4. Imagine you have three animals (X, Y, and Z) on one side of a bridge which you wish to cross them on the other side of the bridge using a motorbike. The motorbike can only hold two items including the rider (yourself) at any one time and of course you are the only one who can ride. If the animal X is ever left alone with animal Y, X will eat it. Similarly if the Y is ever left alone with the Z, then Z will eat it. The goal is to get all the animals and yourself on the other side of the bridge safely using the motorbike.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.
 5. Three people (A, B, and C) and three animals (X, Y, Z) which are carnivorous are on one side of a river, along with a boat that can hold at most two people. For the group of people to be save you need to make sure they are never outnumbered by the carnivorous when left together. The goal is to find a way to get everyone to the other side without ever leaving a group of people in one place outnumbered by the carnivorous in that place.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.
 6. Imagine you have three items to take into the market (X, Y and Z) and you come across a river which you must cross on the way to the market. On the shore there is a boat which can only take one item at a time to the market. To have all the items save this rule must be observed item: Item Y cannot be left together with item Z and item Z cannot be left together with item X. The goal is to cross the river and have all the items taken into the market safely.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.

7. Imagine you have been given a task to sell a product in five cities (A, B, C, D and E). To complete the task you must visit each city exactly once. There are direct roads between each pair of cities on the list. Your goal is to find the shortest route possible which can take you round and visit all the cities exactly once.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.

8. Imagine there are three guys (X, Y and Z) who want to cross a river from the left side to the right side using a boat. While you are in the boat, they behave. But as soon as you leave X with Y or X with Z on one side WITHOUT the boat, they start fighting. Being a peace loving person, you don't want that. The goal is to move them across the river with no fights. The boat can carry up to two passengers including yourself and cannot move by itself.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.

9. Three jealous husbands (X, Y and Z) and their wives (XW, YW and ZW) need to cross a river using a single boat. At no time should any of the women be left in company with any of the men, unless her husband is present. The boat can carry up to two passengers and cannot move by itself.
 - a. Describe the state space representation for this problem and identify the initial state and goal state.
 - b. Identify the rules/operators which can be used to solve this problem
 - c. Apply the above rules and describe the possible solutions to this problem
 - d. Suggest a heuristic function which can be used to guide the search in order to obtain an optimal solution.