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Page No.
Date

AIML [Experiment 1]

Aim :- To implement water jug problem.

Problem statement :- You are given a m liter jug and n liter jug, Both are initially empty, The jugs don't have marking to allow measuring. You have jugs to measure 'x' litres of water in jug 1 and 'y' litres of water in jug2. Find a path from intial state (x_i, y_i) to final state (x_f, y_f) by following given below operations

1) Empty A jug 2) Fill a jug fully 3) Pour water from jug A to B or vice-versa

Approach :- For this problem BFS technique is used to generate the state space tree and reach the final goal. We conclude all possible operation that both jugs can perform

- Fill jug A completely
- Fill B jug completely
- Empty jug A
- Empty jug B
- Pour jug A to jug B till full and vice-versa
- Pour jug A to jug B completely and vice-versa

We take a queue of nodes & run it till its empty and add each of the condition in queue and keep track of visited nodes in order to avoid repetition. As the loop progresses, state space tree of nodes an is generated and eventually a solution

Data Structures :- Queue<Node>, ArrayList<Node> [for visited Nodes]

Input :- (0,0) (initial state), (4,2) (final state) Cap A=4 Cap B=3

Path :- {(0,0), (0,3), (4,0), (4,3), (3,0), (1,3), (3,3), (4,2), (0,2)}

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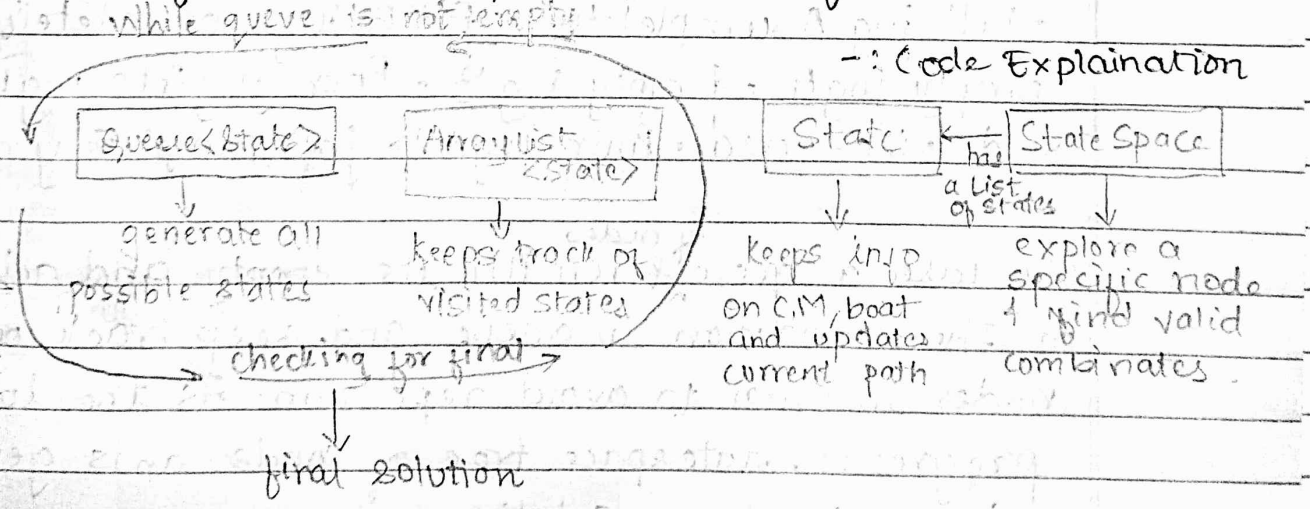
Abbr :- Missionary (M) *
Cannibal (C)

Experiment2 :- (Missionary Cannibal Problem)

Problem Statement :- In this problem, there are 3 M and 3C. They must cross a river from Bank A [initally all there] to Bank B, Boat can carry almost 2 people. If there are more cannibals than M on a bank, the M will kill C. The boat cannot cross the river by itself with no people.

Explaination :- In this problem, we can use the BFS approach to find all possible states and find the path to final state. Intially all C, M are at bank A, we have make such combination that [C >= M] remains true at all times on both banks, We create/generate a state where we check if a certain number of C, M are possible to make on a boat and explore that specific state making a tree of states that will cover all the valid cases pertaining to C, M travelling and staying on a bank. Then it is easily found which path leads to final state



Why BFS is used?

In this M/C problem, BFS is used find the shallowest goal in the state space tree along all the many different possible outcomes making it effective.