Artificial Intelligence — Lab

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Session 1: State Space Search — Decantation Problem

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You are given an 8-litre jar full of water and two empty jars of 5- and 3-litre capacity. You have to get exactly 4 litres of water in one of the jars. You can completely empty a jar into another jar with space or completely fill up a jar from another jar.

1. Formulate the problem: Identify states, actions, initial state, goal state(s). Represent the state by a 3-tuple. For example, the intial state state is (8,0,0). (4,1,3) is a goal state (there may be other goal states also).

2. Use a suitable data structure to keep track of the parent of every state. Write a function to print the sequence of states and actions from the initial state to the goal state.

3. Write a function `next_states(s)` that returns a list of successor states of a given state `s`.

4. Implement Breadth-First-Search algorithm to search the state space graph for a goal state that produces the required sequence of pourings. Use a Queue as `frontier` that stores the discovered states yet be explored. Use a dictionary for `explored` that is used to store the explored states.

5. Modify your program to trace the contents of the Queue in your algorithm. How many states are explored by your algorithm?