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Class: BS AI (4A)

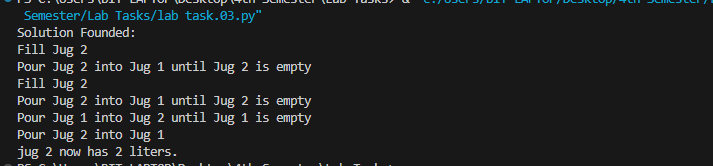
Lab task:3

Submitted to: Sir Rasikh Ali

**Description of Water Jug Problem.**

The Water Jug Problem, a classic puzzle where the goal is to measure a specific amount of water using two jugs of given capacities. The problem is solved using a Depth-First Search (DFS) algorithm, which explores all possible states of the jugs to find a sequence of actions that achieves the desired goal.  
  
**Initialization:**  
  
A stack is employed to save the current state of the jugs **(jug1, jug2)** and the sequence of actions used to arrive at the state (path).  
  
A visited set is employed to maintain a record of visited states so that they are not revisited and the algorithm does not get trapped in infinite loops.  
  
**State Exploration:**  
  
The algorithm pops a state from the stack and verifies if either jug holds the goal amount.  
  
If the target is achieved, it outputs the sequence of steps and the final state of the jugs.  
  
**Rules:**  
  
**Fill Jug 1**: Fill the first jug to capacity.  
  
**Fill Jug 2**: Fill the second jug to capacity.  
  
**Empty Jug 1**: Drain the first jug.  
  
**Empty Jug 2**: Drain the second jug.  
  
**Transfer Jug 1 to Jug 2**: Transfer water from the first jug to the second jug until the second jug is full or the first jug is empty.  
  
**Transfer Jug 2 to Jug 1**: Transfer water from the second jug to the first jug until the first jug is full or the second jug is empty.  
  
**Empty Jug 1 into Jug 2**: Empty all water from the first jug into the second jug.  
 **Empty Jug 2 into Jug 1**: Empty all water from the second jug into the first jug.  
  
**Termination:**  
If the stack is drained without achieving the goal, the algorithm determines that there is no solution and returns "No Solution Found."

Output screenshot:

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