SUPERIOR UNIVERSITY

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Subject: Programming for Artificial Intelligence
Lab Task: 3

Task3: Water Jug Problem

Water Jug Problem - Code Explanation & Rules

1. Problem Statement

The Water Jug Problem involves two jugs with given capacities and a goal to measure an exact amount of water using the available operations.

2. Explanation

Imports

- from collections import deque: Imports deque for efficient queue operations used in BFS.

Function: WaterJugProblem(c1, c2, goal)

- A queue (deque) is used for BFS.
- Visited is used for previously visted values.
- The queue is empty at start (0,0)
- Visited is obviously empty (0,0)

- Check if the goal is reached.

1. **Rules (theoretical)**:
    a. Fill Jug 1 to full capacity.
    b. Fill Jug 2 to full capacity.
    c. Empty Jug 1 completely.
    d. Empty Jug 2 completely.
    e. Pour water from Jug 1 to Jug 2 until Jug 2 is full or Jug 1 is empty.
    f. Pour water from Jug 2 to Jug 1 until Jug 1 is full or Jug 2 is empty.

Solution Found:

- If the goal is found, path will be printed.
- If no solution is possible, an appropriate message is displayed.

3. Rules Used in the Code

1. **Fill Jug 1 to Maximum Capacity**: (c1, jug2)
2. **Fill Jug 2 to Maximum Capacity**: (jug1, c2)
3. **Empty Jug 1 Completely**: (0, jug2)
4. **Empty Jug 2 Completely**: (jug1, 0)
5. **Pour Jug 1 → Jug 2 (until Jug 2 is full or Jug 1 is empty)**: (jug1 - min(jug1, c2 - jug2), jug2 + min(jug1, c2 - jug2))
6. **Pour Jug 2 → Jug 1 (until Jug 1 is full or Jug 2 is empty)**: (jug1 + min(jug2, c1 - jug1), jug2 - min(jug2, c1 - jug1))

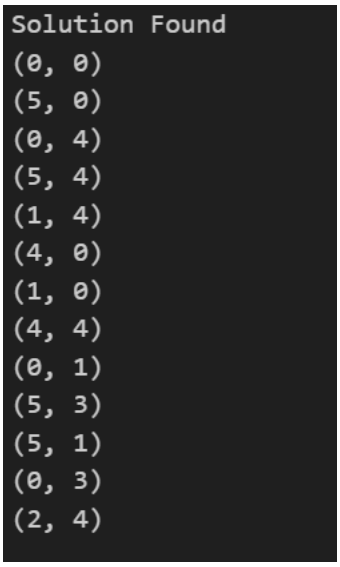
Example:

Goal State is 2

Jug 1 is 5

Jug 2 is 4

output:



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Solution Found
(0, 0)
(5, 0)
(0, 4)
(5, 4)
(1, 4)
(4, 0)
(1, 0)
(4, 4)
(0, 1)
(5, 3)
(5, 1)
(0, 3)
(2, 4)
```