EX.NO:03

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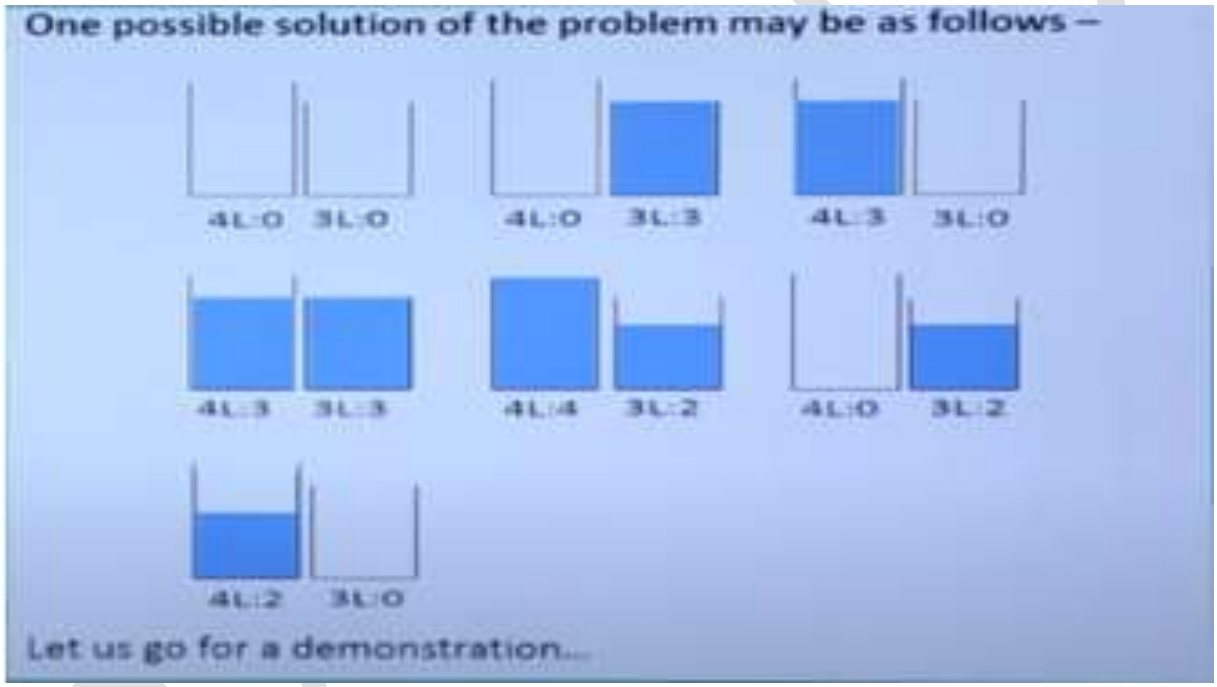
DEPTH FIRST SEARCH – WATER JUG PROBLEM

In the **water jug problem in Artificial Intelligence**, we are provided with two jugs: one having the capacity to hold 3 gallons of water and the other has the capacity to hold 4 gallons of water. There is no other measuring equipment available and the jugs also do not have any kind of marking on them. So, the agent's task here is to fill the 4-gallon jug with 2 gallons of water by using only these two jugs and no other material. Initially, both our jugs are empty.



AIM :

To implement a python program for Water Jug problem using depth first search problem

SOURCE CODE :

```
from collections import deque

def DFS(a, b, target):

    m = {}
```

```
    isSolvable = False
    path = []
    q = deque()

    q.append((0, 0))

    while (len(q) > 0):
        u = q.popleft()
        if ((u[0], u[1]) in m):
            continue

        if ((u[0] > a or u[1] > b or
             u[0] < 0 or u[1] < 0)):
            continue

        path.append([u[0], u[1]])

        m[(u[0], u[1])] = 1

        if (u[0] == target or u[1] == target):
            isSolvable = True

            if (u[0] == target):
                if (u[1] != 0):

                    path.append([u[0], 0])
            else:
                if (u[0] != 0):
                 path.append([0, u[1]])
                sz = len(path)
                for i in range(sz):
                  print("(", path[i][0], ",",path[i][1], ")")
            break
        q.append([u[0], b])
        q.append([a, u[1]])
    for ap in range(max(a, b) + 1):
            c = u[0] + ap
            d = u[1] - ap

            if (c == a or (d == 0 and d >= 0)):
                q.append([c, d])

            c = u[0] - ap
```

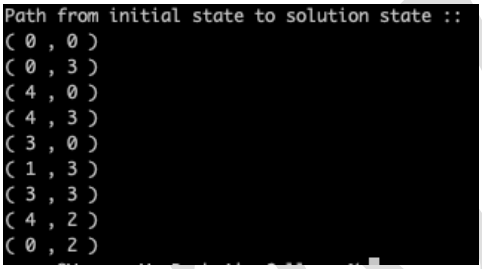
```
        d = u[1] + ap

        if ((c == 0 and c >= 0) or d == b):
            q.append([c, d])

    q.append([a, 0])
    q.append([0, b])
if (not isSolvable):
    print ("No solution")

Jug1, Jug2, target = 4, 3, 2
print("Path from initial state ""to solution state ::")
DFS(Jug1, Jug2, target)
```

OUTPUT :



RESULT : Thus the python program to implement water jug problem have been implemented successfully.

EX.NO: 04

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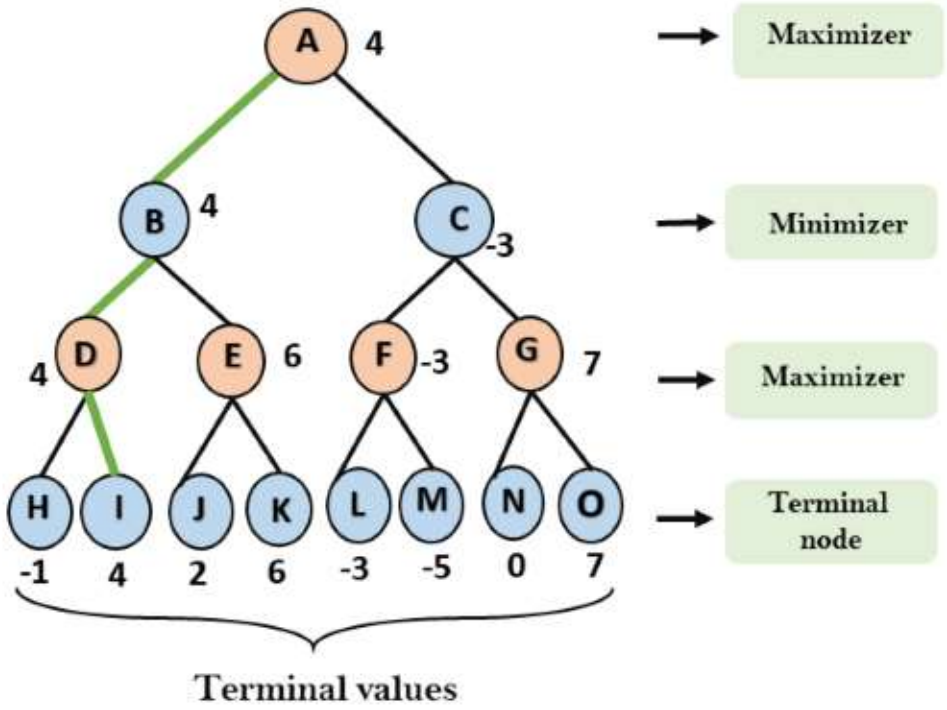
MINIMAX ALGORITHM

- A simple example can be used to explain how the minimax algorithm works. We've included an example of a game-tree below, which represents a two-player game.
- There are two players in this scenario, one named Maximizer and the other named Minimizer.
- Maximizer will strive for the highest possible score, while Minimizer will strive for the lowest possible score.
- Because this algorithm uses DFS, we must go all the way through the leaves to reach the terminal nodes in this game-tree.
- The terminal values are given at the terminal node, so we'll compare them and retrace the tree till we reach the original state.



AIM :

To implement MINIMAX Algorithm problem using Python.

SOURCE CODE :