School of Computer Science and Engineering
VIT-AP University
Artificial Intelligence: CSE 3002
Laboratory Assignment-5

Topic: Uninformed Search based Problems-2

1. You have an 8 litre jug full of water and two smaller jugs, one that contains 5 litres and the other 3 litres. None of the jugs have markings on them, nor do you have any additional measuring device. You have to divide the 8 litres of water equally between your two best friends, so that each gets 4 litres of water. How can you do this?

Code:

```
#21BCE8421 Harshita Pasupuleti
capacity = (8,5,3)
x = capacity[0]
y = capacity[1]
z = capacity[2]
memory = {}
ans = []
def get_all_states(state):
    # Let the 3 jugs be called a,b,c
    a = state[0]
    b = state[1]
    c = state[2]
    if(a==4 and b==4):
        ans.append(state)
        return True
        if((a,b,c) in memory):
            return False
            memory[(a,b,c)] = 1
            #empty jug a
            if(a>0):
                #empty a into b
                if(a+b<=y):
                    if(get_all_states((0,a+b,c)) ):
                        ans.append(state)
                        return True
                    else:
                        if( get_all_states((a-(y-b), y, c)) ):
                            ans.append(state)
                            return True
                            #empty a into c
                            if(a+c<=z):
                                if( get_all_states((0,b,a+c)) ):
                                    ans.append(state)
                                    return True
                                else:
                                    if(get_all_states((a-(z-c), b, z)) ):
                                        ans.append(state)
                                        return True
                                        #empty jug b
                                        if(b>0):
                                            #empty b into a
                                            if(a+b<=x):
                                                if( get_all_states((a+b, 0, c)) ):
                                                    ans.append(state)
                                                    return True
                                                else:
                                                    if( get_all_states((x, b-(x-a), c)) ):
                                                        ans.append(state)
                                                        return True
                                                        #empty b into c
```

```
if( get_all_states((x, b-(x-a), c)) ):
    ans.append(state)
    return True
    #empty b into c
    if(b+c<=z):
        if( get_all_states((a, 0, b+c)) ):
            ans.append(state)
            return True
        else:
            if( get_all_states((a, b-(z-c), z)) ):
                ans.append(state)
                return True
                #empty jug c
                if(c>0):
                    #empty c into a
                    if(a+c<=x):
                        if( get_all_states((a+c, b, 0)) ):
                            ans.append(state)
                            return True
                        else:
                            if( get_all_states((x, b, c-(x-a))) ):
                                ans.append(state)
                                return True
                                #empty c into b
                                if(b+c<=y):
                                    if( get_all_states((a, b+c, 0)) ):
                                        ans.append(state)
                                        return True
                                    else:
                                        if( get_all_states((a, y, c-(y-b))) ):
                                            ans.append(state)
                                            return True
                                            return False
                                            initial_state = (8,0,0)
                                            print("Steps : \n")
                                            get_all_states(initial_state)
                                            ans.reverse()
                                            print("Starting work")
                                            for i in ans:
                                                print(i)
```

Output:

```
Starting work
(8,0,0)
(3,5,0)
(0,5,3)
(5,0,3)
(5,3,0)
(2,3,3)
(2,5,1)
(7,0,1)
(7,1,0)
(4,1,3)
(4,4,0)
```

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