

Experiment No.1

Semester	T.E. Semester VI
Subject	ARTIFICIAL INTELLIGENCE (CSL 604)
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Title:

Water Jug Problem (Menu Driven)

Theory:

The water jug problem is a classic puzzle that involves two jugs with known capacities, and the task is to measure a specific amount of water using these jugs. The jugs can be filled, emptied, and water can be transferred between them.

Objective:

In this program, the objective is to make the 4g jug contain exactly 2g of water.

Jug Capacities:

- 4g Jug (g₄): Represents the jug with a capacity of 4 units.
- 3g Jug (g₃): Represents the jug with a capacity of 3 units.

Program Explanation:

Initial State:

The program starts with both jugs empty (0g in both).

Program Code:

```
#include<iostream>
using namespace std;

void fill_3g(int &x,int &y){
    if(y<3){
        y=3;
        return;
    }else{
        cout<<"Already Filled"<<endl;
    }
}

void fill_4g(int &x,int &y){
    if(x<4){
        x=4;
        return;
    }else{
        cout<<"Already Filled"<<endl;
    }
}

void empty_3g(int &x,int &y){
    if(y>0){
        y=0;
        return;
    }else{
        cout<<"Already Empty"<<endl;
    }
}

void transfer_all_3g_to_4g(int &x,int &y){
    if(x+y<=4 && y>0){
        x=x+y;
        y=0;
        return;
    }else{
        if(y<=0){
            cout<<"3g is empty"<<endl;
        }else{
            cout<<"Water will over flow"<<endl;
        }
    }
}
```

```

}

void transfer_all_4g_to_3g(int &x,int &y){
    if(x+y<=3 && x>0){
        y=x+y;
        x=0;
        return;
    }else{
        if(x<=0){
            cout<<"4g is empty"<<endl;
        }else{
            cout<<"Water will over flow"<<endl;
        }
    }
}

void transfer_some_3g_to_4g_Until_4g_is_Full(int &x,int &y){
    if(x+y>4 && y>0 && x<4 ){
        y=y-(4-x);
        x=4;

        return;
    }else{
        if(y==0){
            cout<<"3g is empty"<<endl;
        }else if(y==4){
            cout<<"4 is already filled"<<endl;

        }else{
            cout<<"what is not enough to fill 4g"<<endl;
        }
    }
}

void transfer_some_4g_to_3g_Until_3g_is_Full(int &x,int &y){
    if(x+y>3 && x>0 && y<3){
        x=x-(3-y);
        y=3;

        return;
    }else{
        if(x==0){
            cout<<"4g is empty"<<endl;
        }else if(y==3){
            cout<<"3 is already filled"<<endl;

        }else{

```

```

        cout<<"what is not enough to fill 3g"<<endl;
    }
}

void empty_4g(int &x,int &y){
    if(x>0){
        x=0;
        return;
    }else{
        cout<<"Already Empty";
    }
}

int main(){

cout << "Let's start the water jug problem" << endl;
cout<<"Task: make 4g jug to have 2g water"<<endl;
    int g_4 = 0;
    int g_3 = 0;

    while (true) {
        cout << "\nCurrent States :" << endl;
        cout << "4g:" << g_4 << endl;
        cout << "3g:" << g_3 << endl;

        if(g_4==2){
            cout<<"congratulation you are smart!"<<endl;
            return 0;
        }

        cout << "\nMenu:" << endl;
        cout << "1. Fill 3g jug\n2. Fill 4g jug\n3. Empty 3g jug\n4. Empty 4g jug\n";
        cout << "5. Transfer all from 3g to 4g\n6. Transfer all from 4g to 3g\n";
        cout << "7. Transfer some from 3g to 4g until 4g is full\n";
        cout << "8. Transfer some from 4g to 3g until 3g is full\n9. Quit\n";

        int choice;
        cout << "Enter your choice (1-9): ";
        cin >> choice;

        switch (choice) {
            case 1:
                fill_3g(g_4, g_3);

```

```

        break;
    case 2:
        fill_4g(g_4, g_3);
        break;
    case 3:
        empty_3g(g_4, g_3);
        break;
    case 4:
        empty_4g(g_4, g_3);
        break;
    case 5:
        transfer_all_3g_to_4g(g_4, g_3);
        break;
    case 6:
        transfer_all_4g_to_3g(g_4, g_3);
        break;
    case 7:
        transfer_some_3g_to_4g_Until_4g_is_Full(g_4, g_3);
        break;
    case 8:
        transfer_some_4g_to_3g_Until_3g_is_Full(g_4, g_3);
        break;
    case 9:
        cout << "Exiting the program.\n";
        return 0;
    default:
        cout << "Invalid choice. Please enter a number between 1 and
9.\n";
    }

}

return 0;
}

```

Output:

```
Enter your choice (1-9): 2

Current States :
4g:4
3g:0

Menu:
1. Fill 3g jug
2. Fill 4g jug
3. Empty 3g jug
4. Empty 4g jug
5. Transfer all from 3g to 4g
6. Transfer all from 4g to 3g
7. Transfer some from 3g to 4g until 4g is full
8. Transfer some from 4g to 3g until 3g is full
9. Quit
Enter your choice (1-9): 8

Current States :
4g:1
3g:3

Menu:
1. Fill 3g jug
2. Fill 4g jug
3. Empty 3g jug
4. Empty 4g jug
5. Transfer all from 3g to 4g
6. Transfer all from 4g to 3g
7. Transfer some from 3g to 4g until 4g is full
8. Transfer some from 4g to 3g until 3g is full
9. Quit
Enter your choice (1-9): █
```

Conclusion:

The water jug problem is a classic example of problem-solving using basic operations such as filling, emptying, and transferring. The provided C++ program effectively simulates the problem and allows the user to interactively perform actions on the jugs to achieve the specified objective.