

**UCS2504 - Artificial Intelligence Lab**  
**Department of CSE, SSN College of Engineering**  
**Lab Assignment 1**

**Uninformed Search Strategies**

You are given a box with a combination of two-color balls (RED, GREEN). Assume that you are counting the balls in the box as a sequence of ODD and EVEN numbers for RED and GREEN respectively.

Write a python function for the following as per user choice:

1. Write a function to generate a sequence for  $n$  balls as states based on the color and print the same. Use a suitable data structure to keep track of the parent of every state and show the structure as a state space representation.
2. Write a function to print the sequence of states and actions from the *initial state to the goal state* using BFS with suitable data structure.
3. Write a function to print the sequence of states and actions from the *initial state to the goal state* using DFS with suitable data structure.
4. Write a function to print the sequence of states and actions from the *initial state to the goal state* using DLS with suitable data structure.  
Hint: Read limit value and goal state
5. Write a function to print the sequence of states and actions from the *initial state to the goal state for every level* using IDS with suitable data structure.  
Hint: Read limit value and goal state.

**Application using Uninformed Search Strategies: Decantation Problem (Water jug Problem)**

You are given two jugs, a 4-litre one and a 3-litre one. Neither has any measuring markers on it. There is a pump that can be used to fill the jugs with water. How can you get exactly 2 litres of water into a 4-litre jug.

- A. Formulate the problem: Identify state, initial state, goal state, conditions, actions and state space tree.  
Hint: Complete state space tree till level 3 and partial structure with all solution paths from level 4 to level 6.  
State: (X, Y)  
Initial state: (0,0)  
Goal state: (2, n)  
Conditions: Given in problem  
Actions: 10 Rules
- B. Use a suitable data structure to keep track of the parent of every state. Write a function to print all possible solution sequences from the initial state to the goal state (number of solutions)

C. Write a function `next_state(S)` that returns a list of successor states of a given state 'S'.

D. Implement the following *Search Algorithms* to search the state space tree for a goal state that produces the required sequence of pouring's from the initial state and its path cost.

(a) BFS (b) DFS (c) DLS with limit=6 (d) IDS

E. Compare the path cost of each search algorithm and find the best solution. Justify your answer.

Content to be written in **Observation** for output verification:

- i. Date
- ii. Ex. No
- iii. Title
- iv. Aim
- v. Data structure used (with justification)
- vi. Logic applied or Algorithm (short description) or Function routines.
- vii. Sample input and output