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**Week (3)** 

#### **Section Content:**

**♣** State space

### State space search

State space search is a method for solving problems by exploring all possible configurations (states) of a problem. You start at an initial state, apply actions to transition between states, and continue until you find a goal state (the solution). It's like searching through a maze of possible solutions.

### **Types**

- The water jug problem
- N-puzzle problem
- N-Queen problem
- Tic-Tac problem

#### **Problem definition**

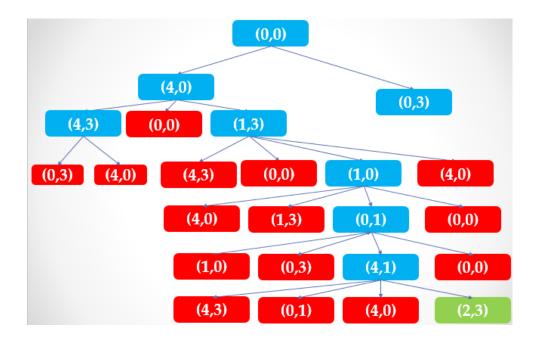
- Define state space
- Define initial state
- Define goal state
- Define operation

# Water jug problem

<u>First problem</u> we use two jugs called four and three; four holds a maximum of four gallons of water and three a maximum of three gallons of water.

The start state is (0, 0) and the goal state is (2, n) where n may be any but it is limited to three holding from 0 to 3 gallons of water or empty. Rules: fill 4 gallons, fill 3 gallons, empty 4 gallons, empty 3 gallons, transfer.

#### **Solution**



<u>Second problem</u> we use three jugs, eight holds a maximum of eight gallons of water, five a maximum of five gallons of water and three a maximum of three gallons of water.

The start state is (8, 0, 0) and the goal state is (4, 4, 0)

Rules: fill, transfer.

**Solution** 



## **N-Puzzle problem**

N-puzzle that consists of N tiles (N+1 titles with an empty tile) where N can be 8, 15, 24 and so on

$$N = 8 \rightarrow 8+1=9 \rightarrow sqr(9) = 3$$
 So, matrix 3\*3

$$N = 15 \rightarrow 15+1=16 \rightarrow sqr(16) = 4 So, matrix 4*4$$

$$N = 24 \rightarrow 24+1=25 \rightarrow sqr(25) = 5$$
 So, matrix 5\*5

First problem We are solving a problem of 8 puzzle that is a 3x3 matrix

Initial state						
2	8	3				
1	6	4				
7		5				

Goal state					
1	2	3			
8		4			
7	6	5			

The puzzle can be solved by moving the tiles one by one in the single empty space and thus achieving the Goal state.

Rules of solving puzzle: Up, Down, Right or Left

### **Solution**

2	8	3
1	6	4
7		5

### N-Queen problem

- 1. N-Queen problem is based on chess games.
- 2. The problem is based on arranging the queens on chessboard in such a way that no two queens can attack each other.
- 3. The N-Queen problem states as consider a n x n chessboard on which we have to place n queens so that no two queens attack each other by being in the same row or in the same column or on the same diagonal.

## First problem 2 – Queen's problem

#### **Solution**

Not solvable









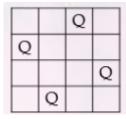




### Second problem 4 – Queen's problem

#### **Solution**

Is solvable

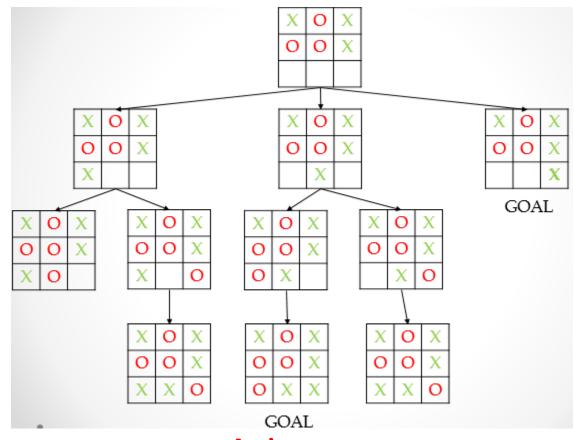


# Tic-Tac problem

**problem** Starting from initial state as we move on applying rules of putting X(cross) or O(zero) we keep on generating the states. get to goal where X is the next to play draw state space tree with all possibilities.



#### **Solution**



# **Assignment**

1. Search about text mining, data mining, web mining.