LAB - 2

Implement Iterative deepening search (IDS) algorithm (8 Puzzle Problem)

Algorithm

Input:

start → Initial 3x3 board configuration
goal → target board configuration

Step 1:- Define possible moves

- Locate blank (0)
- Moves = {Up, Down, Left, Right}, but only if inside board.
- Each move = swap 0 with the adjacent tile.

Step 2:- Depth Limited Search (DLS)

- A recursive function that:

1) If current state = goal → return success
2) If depth limit = 0 → stop return failure
3) Else → generate all possible moves (children)
4) For each child, call DLS(child, limit - 1)
5) If any child reaches goal → return path

Step 3:- Iterative Deepening Loop

- Start with depth = 0
- While not solved:
  - Call DLS(start, depth)
  - If solved → stop
  - Else → increase depth = depth + 1 and repeat.

Step 4 :- Output

- Number of moves = depth where goal was found

Initial State

(2, 8, 3,
1, 6, 4,
7, 0, 5)

Goal State

(1, 2, 3,
8, 0, 4,
7, 6, 5)

IDS Solution found

Moves : UULDR

Move : U

2	8	3
1	0	4
7	6	5

Move : U

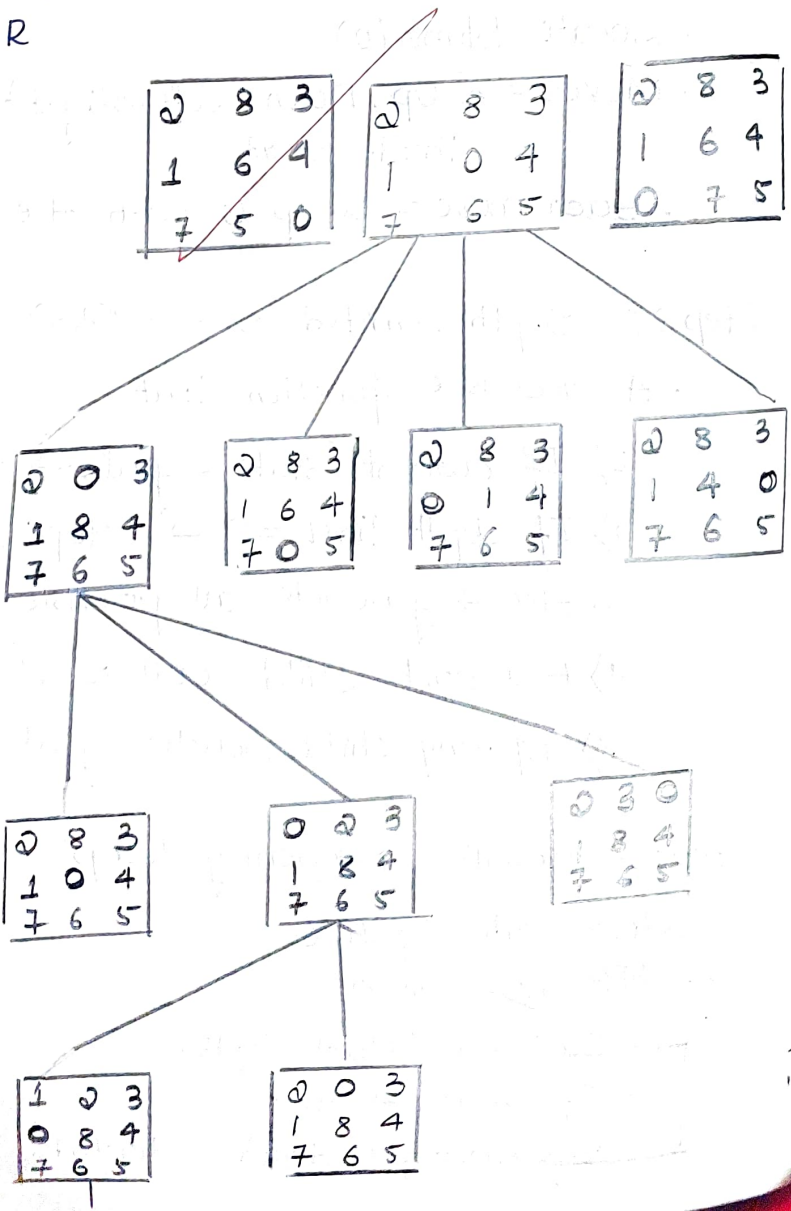
2	0	3
1	8	4
7	6	5

Move : L

0	2	3
1	8	4
7	6	5

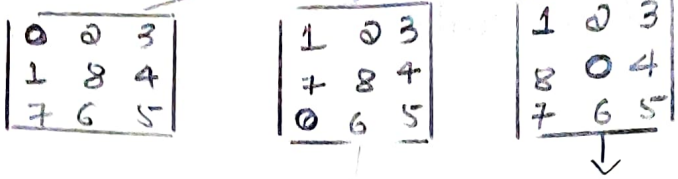
Move : D

1	2	3
0	8	4
7	6	5



Move : R

1	2	3
8	0	4
7	6	5



Implement 8 puzzle problem using DFS

Algorithm:

Input:

- Initial state, start of the 8 puzzle
- Goal State

Output:

- A sequence of moves (path) from start to goal (if found)
- failure if no solution exists

Step 1 :- Start, read the initial state & goal state

Step 2 :- Initialize

- Create an empty stack
- Push start node onto the stack with depth=0
- Initialize an empty set visited.

Step 3 :- Repeat until the stack is empty

Step 4 :- If the stack becomes empty and no goal is found, return failure

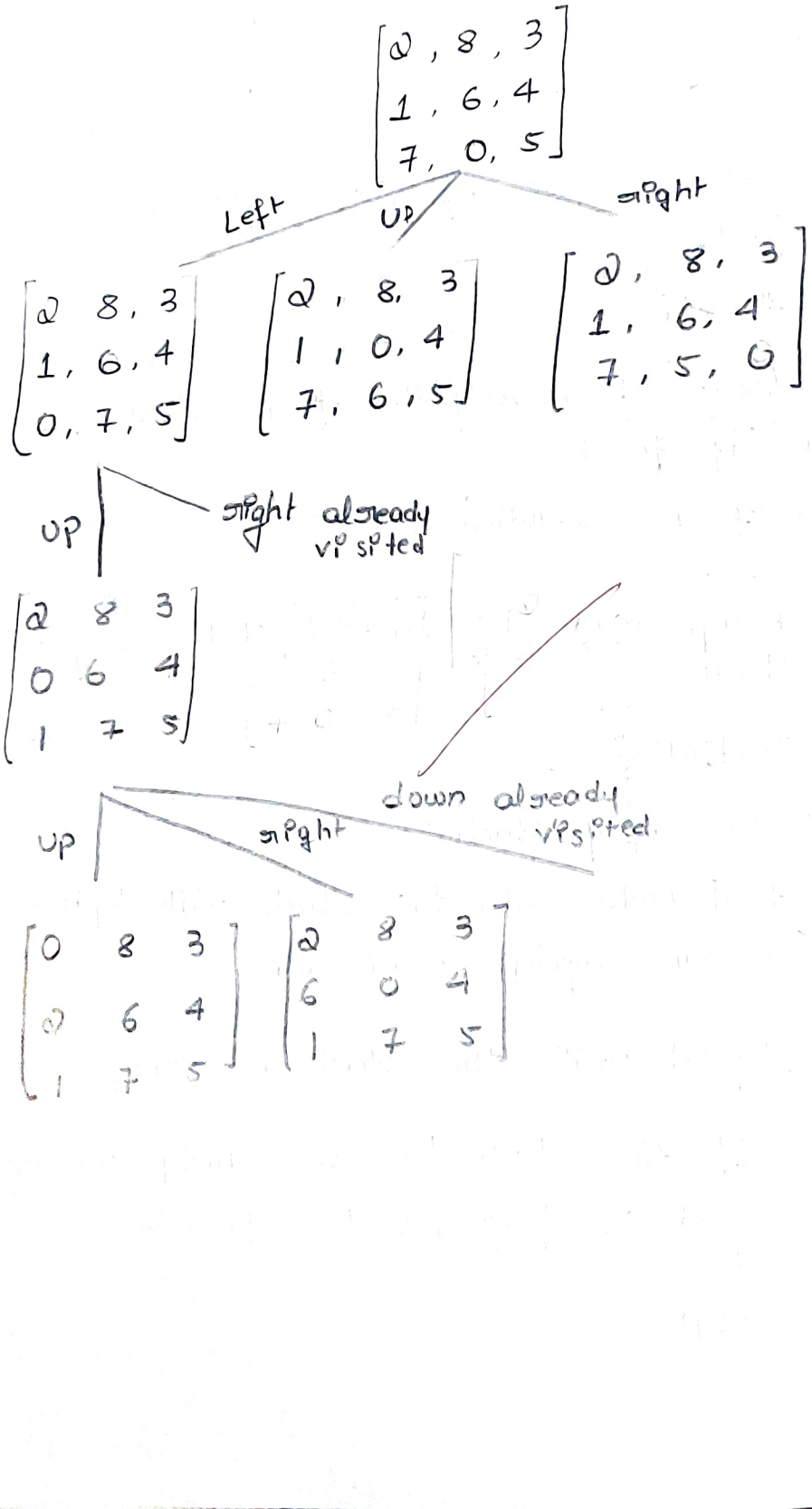
Step 5 :- Stop

Initial State

(2, 8, 3
1, 6, 4
7, 0, 5)

Goal State

(1, 2, 3
8, 0, 4
7, 6, 5)



DFS :-

D-1

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 6 \\ 7 & 5 & 8 \end{bmatrix}$$

D-2

$$\begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 6 \\ 0 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 6 \\ 0 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 0 & 6 \\ 7 & 5 & 8 \end{bmatrix}$$

D-3

$$\begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 6 \\ 5 & 0 & 8 \end{bmatrix}$$

D-4

$$\begin{bmatrix} 1 & 2 & 3 \\ 7 & 0 & 6 \\ 5 & 4 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 6 \\ 5 & 8 & 0 \end{bmatrix}$$

D-5

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 7 & 6 \\ 5 & 4 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 7 & 6 & 0 \\ 5 & 4 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 0 & 3 \\ 7 & 2 & 6 \\ 5 & 4 & 8 \end{bmatrix}$$

upto Depth ''

IDS:-

D-0

$$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 6 \\ 7 & 5 & 8 \end{bmatrix}$$

D-1

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 0 & 6 \\ 7 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 6 \\ 0 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 0 & 2 & 3 \\ 1 & 4 & 6 \\ 7 & 5 & 8 \end{bmatrix}$$

D-2

$$\begin{bmatrix} 1 & 0 & 3 \\ 4 & 2 & 6 \\ 7 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 0 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 6 & 0 \\ 7 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 7 & 4 & 6 \\ 5 & 0 & 8 \end{bmatrix} \quad \begin{bmatrix} 2 & 0 & 3 \\ 1 & 4 & 6 \\ 7 & 5 & 8 \end{bmatrix}$$

D-3

$$\begin{bmatrix} 0 & 1 & 3 \\ 4 & 2 & 6 \\ 7 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 3 & 0 \\ 4 & 2 & 6 \\ 7 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 0 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 0 & 7 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 0 \\ 4 & 6 & 3 \\ 7 & 5 & 8 \end{bmatrix} \quad \begin{bmatrix} 1 & 2 & 3 \\ 4 & 6 & 8 \\ 7 & 5 & 0 \end{bmatrix}$$

4th

1/9/25