Program 3 : 8 Puzzle Iterative Deepening Search Algorithm

Code:

```
# 8 Puzzle problem using Iterative deepening depth first search algorithm

def id_dfs(puzzle, goal, get_moves):
    import itertools
#get_moves -> possible_moves
    def dfs(route, depth):
        if depth == 0:
            return
        if route[-1] == goal:
            return route
        for move in get_moves(route[-1]):
            if move not in route:
                next_route = dfs(route + [move], depth - 1)
                if next_route:
                    return next_route

    for depth in itertools.count():
        route = dfs([puzzle], depth)
        if route:
            return route


def possible_moves(state):
    b = state.index(0)  # ) indicates White space -> so b has index of it.
    d = []  # direction

    if b not in [0, 1, 2]:
        d.append('u')
    if b not in [6, 7, 8]:
        d.append('d')
    if b not in [0, 3, 6]:
        d.append('l')
    if b not in [2, 5, 8]:
        d.append('r')

    pos_moves = []
    for i in d:
        pos_moves.append(generate(state, i, b))
    return pos_moves


def generate(state, m, b):
```

```
    temp = state.copy()

    if m == 'd':
        temp[b + 3], temp[b] = temp[b], temp[b + 3]
    if m == 'u':
        temp[b - 3], temp[b] = temp[b], temp[b - 3]
    if m == 'l':
        temp[b - 1], temp[b] = temp[b], temp[b - 1]
    if m == 'r':
        temp[b + 1], temp[b] = temp[b], temp[b + 1]

    return temp


# calling ID-DFS
initial = [1, 2, 3, 0, 4, 6, 7, 5, 8]
goal = [1, 2, 3, 4, 5, 6, 7, 8, 0]

route = id_dfs(initial, goal, possible_moves)

if route:
    print("Success!! It is possible to solve 8 Puzzle problem")
    print("Path:", route)
else:
    print("Failed to find a solution")
```

Observation :

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8 Puzzle problem using ID-DFS

Code :

```
def id_dfs(puzzle, goal, get_moves):
  import itertools

def dfs(route, depth):
    if depth == 0:
        return
    if route[-1] == goal:
        return route
    for move in get_moves(route[-1]):
        if move not in route:
            next_route = dfs(route+[move], depth-1)
        if next_route:
            return next_route

  for depth in itertools.count():
      route = dfs([puzzle], depth)
    if route:
        return route

def possible_moves(state):
    b = state.index(0)
    d = []
    if b not in [0,1,2]:
      d.append('u')
    if b not in [6,7,8]:
```

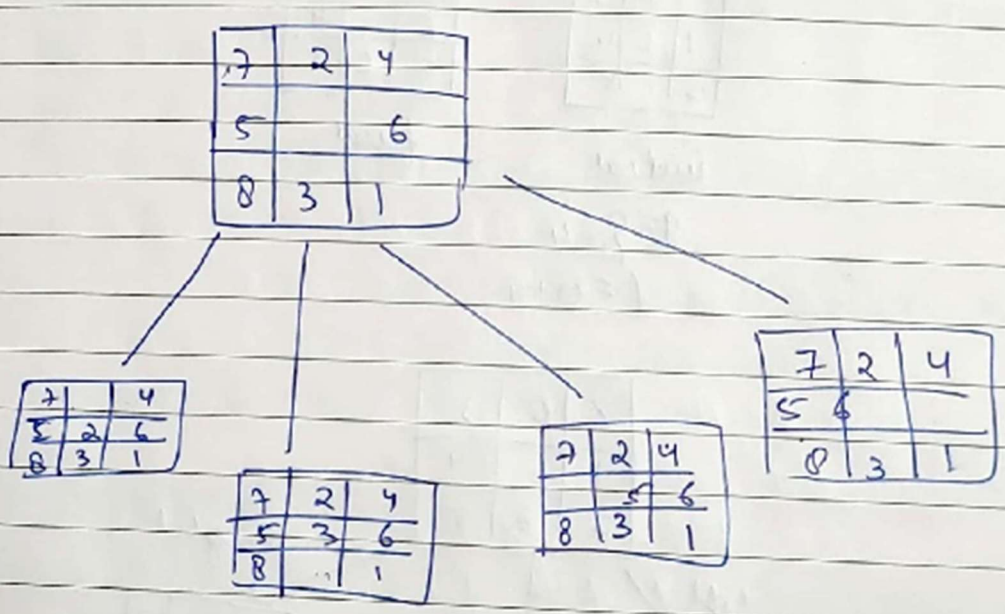
ID_DFS Combination of DFS and BFS
- DFS in BFS manner.

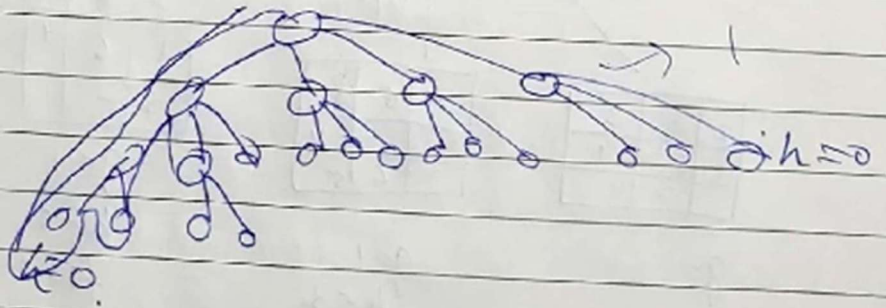
7	2	4
5		6
8	3	1

initial

	1	2
3	4	5
6	7	8

goal





Output:

```
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Success!! It is possible to solve 8 Puzzle problem
Path: [[1, 2, 3, 0, 4, 6, 7, 5, 8], [1, 2, 3, 4, 0, 6, 7, 5, 8], [1, 2, 3, 4, 5, 6, 7, 0, 8], [1, 2, 3, 4, 5, 6, 7, 8, 0]]
```