Vacuum Cleaner Algorithm:

Vacuum Cleaner

```
function vacuum_world (location, status, location1, status1).
    goal_state ← {'A' : '0', 'B' : '0'}
    cost ← 0
    function clean (location):
        goal_state[location] ← '0
        cost ← cost + 1
    for location in [location_input, other_location]:
        if location is 'Dirty':
            clean(location)
            if moving to other location:
                cost ← cost + 1
                print(cost
    print final goal state
    print performance_measurement (cost)
```

8 Puzzle: Algorithm

3) 8 puzzle game

BFS Algorithm:

Loop
    if fringe is empty return ~~fun~~ failure
        node ← remove first(fringe)
    if node is at goal
        then return the path from initial state to
            final state
    else generate all successors of node
        and add all generated node to the back
        of fringe
END Loop

DFS Algorithm:

Loop
    if fringe is empty return failure
        node ← remove-first (fringe)
    if node is at goal
        then return the path from initial state
            to final state
    else generate all successors of node
        and add generated node to the
        front of fringe
End Loop

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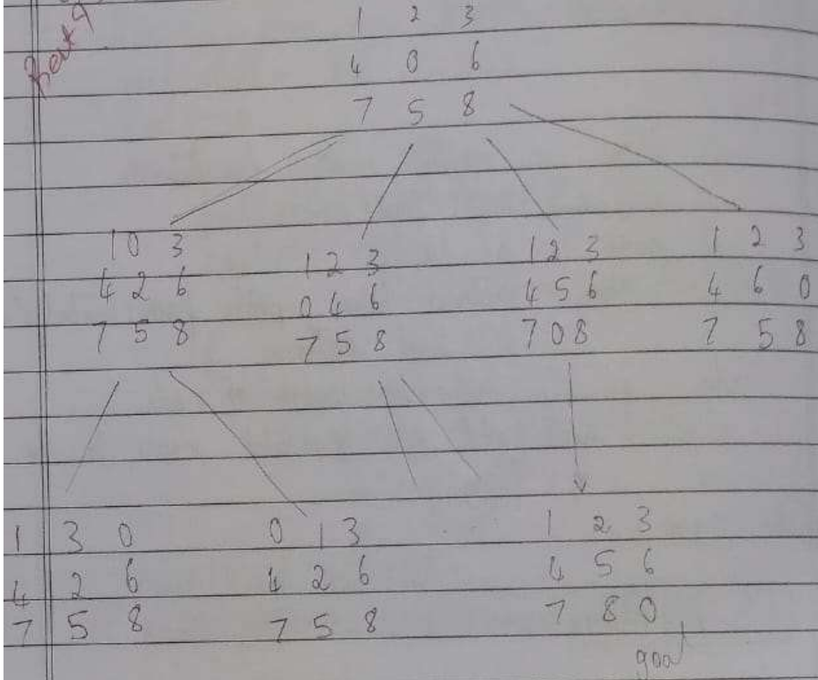
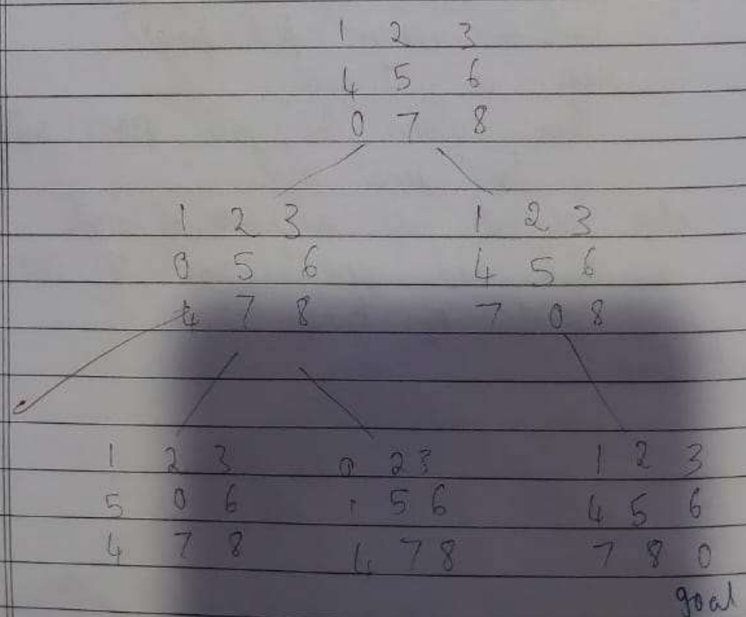
State Space tree:

BFS →



DFS →



Vacuum and 8puzzle

November 9, 2024

[3]:
```
print("Name:Vignesh Bhat","USN:1BM22CS327",sep="\n")

def vacuum_world():
    # Initializing goal_state
    # 0 indicates Clean and 1 indicates Dirty
    goal_state = {'A': '0', 'B': '0'}
    cost = 0
    location_input = input("Enter Location of Vacuum (A or B): ").strip().
 ↪upper()  # User input for vacuum location
    status_input = input(f"Enter status of {location_input} (0 for Clean, 1 for␣
 ↪Dirty): ").strip()   # Status of the current location
    other_location = 'B' if location_input == 'A' else 'A'
    status_input_complement = input(f"Enter status of {other_location} (0 for␣
 ↪Clean, 1 for Dirty): ").strip()   # Status of the other room

    print("Initial Location Condition: " + str(goal_state))

    # Helper function to clean a location
    def clean(location):
        nonlocal cost
        goal_state[location] = '0'
        cost += 1  # Cost for sucking dirt
        print(f"Location {location} has been Cleaned. Cost: {cost}")

    # Main logic
    if location_input == 'A':
        print("Vacuum is placed in Location A.")
        if status_input == '1':
            print("Location A is Dirty.")
            clean('A')
            if status_input_complement == '1':
                print("Location B is Dirty.")
                print("Moving right to  Location  B.")
                cost += 1  # Cost for moving right
                print(f"COST for moving RIGHT: {cost}")
                clean('B')
            else:
```

```python
                print("Location B is already clean.")
        else:
            print("Location A is already clean.")
            if status_input_complement == '1':
                print("Location B is Dirty.")
                print("Moving right to Location B.")
                cost += 1  # Cost for moving right
                print(f"COST for moving RIGHT: {cost}")
                clean('B')
            else:
                print("Location B is already clean.")

    else:  # Vacuum is placed in Location B
        print("Vacuum is placed in Location B.")
        if status_input == '1':
            print("Location B is Dirty.")
            clean('B')
            if status_input_complement == '1':
                print("Location A is Dirty.")
                print("Moving left to Location A.")
                cost += 1  # Cost for moving left
                print(f"COST for moving LEFT: {cost}")
                clean('A')
            else:
                print("Location A is already clean.")
        else:
            print("Location B is already clean.")
            if status_input_complement == '1':
                print("Location A is Dirty.")
                print("Moving left to Location A.")
                cost += 1  # Cost for moving left
                print(f"COST for moving LEFT: {cost}")
                clean('A')
            else:
                print("Location A is already clean.")

    # Done cleaning
    print("GOAL STATE: ")
    print(goal_state)
    print("Performance Measurement: " + str(cost))

# Output
vacuum_world()
```

Name:Vignesh Bhat
USN:1BM22C327
Enter Location of Vacuum (A or B): B

```
Enter status of B (0 for Clean, 1 for Dirty): 1
Enter status of A (0 for Clean, 1 for Dirty): 1
Initial Location Condition: {'A': '0', 'B': '0'}
Vacuum is placed in Location B.
Location B is Dirty.
Location B has been Cleaned. Cost: 1
Location A is Dirty.
Moving left to Location A.
COST for moving LEFT: 2
Location A has been Cleaned. Cost: 3
GOAL STATE:
{'A': '0', 'B': '0'}
Performance Measurement: 3
```

[4]:

```
# 8 puzzle problem using BFS technique

print("Name:Vignesh Bhat","USN:1BM22CS327",sep="\n")

from collections import deque

def solve_8puzzle_bfs(initial_state):
    """
    Solves the 8-puzzle using Breadth-First Search.

    Args:
        initial_state: A list of lists representing the initial state of the␣
↪puzzle.

    Returns:
        A list of lists representing the solution path, or None if no solution␣
↪is found.
    """

    def find_blank(state):
        """Finds the row and column of the blank tile."""
        for row in range(3):
            for col in range(3):
                if state[row][col] == 0:
                    return row, col

    def get_neighbors(state):
        """Generates possible neighbor states by moving the blank tile."""
        row, col = find_blank(state)
        neighbors = []
        if row > 0:
            new_state = [row[:] for row in state]
            new_state[row][col], new_state[row - 1][col] = new_state[row -␣
```

```
            neighbors.append(new_state)
        if row < 2:
            new_state = [row[:] for row in state]
            new_state[row][col], new_state[row + 1][col] = new_state[row +
↪1][col], new_state[row][col]
            neighbors.append(new_state)
        if col > 0:
            new_state = [row[:] for row in state]
            new_state[row][col], new_state[row][col - 1] = new_state[row][col -
↪1], new_state[row][col]
            neighbors.append(new_state)
        if col < 2:
            new_state = [row[:] for row in state]
            new_state[row][col], new_state[row][col + 1] = new_state[row][col +
↪1], new_state[row][col]
            neighbors.append(new_state)
        return neighbors

    goal_state = [[1, 2, 3], [4, 5, 6], [7, 8, 0]]
    queue = deque([(initial_state, [])])
    visited = set()

    while queue:
        current_state, path = queue.popleft()
        if current_state == goal_state:
            return path + [current_state]

        visited.add(tuple(map(tuple, current_state)))
        for neighbor in get_neighbors(current_state):
            if tuple(map(tuple, neighbor)) not in visited:
                queue.append((neighbor, path + [current_state]))

    return None  # No solution found

# Example usage:
initial_state = [[1, 2, 3], [4, 0, 6], [7, 5, 8]]
solution = solve_8puzzle_bfs(initial_state)

if solution:
    print("Solution found:")
    for state in solution:
        for row in state:
            print(row)
        print()
else:
    print("No solution found.")
```

Name:Vignesh Bhat

USN:1BM22CS327
Solution found:
[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]

[5]:
```python
# 8 puzzle problem using DFS technique

print("Name:Vignesh Bhat","USN:1BM22CS327",sep="\n")

from collections import deque

def solve_8puzzle_dfs(initial_state):
    """
    Solves the 8-puzzle using Depth-First Search.

    Args:
        initial_state: A list of lists representing the initial state of the␣
↪puzzle.

    Returns:
        A list of lists representing the solution path, or None if no solution␣
↪is found.
    """

    def find_blank(state):
        """Finds the row and column of the blank tile."""
        for row in range(3):
            for col in range(3):
                if state[row][col] == 0:
                    return row, col

    def get_neighbors(state):
        """Generates possible neighbor states by moving the blank tile."""
        row, col = find_blank(state)
        neighbors = []
        directions = [(-1, 0), (1, 0), (0, -1), (0, 1)]  # Up, Down, Left, Right
```

```
            new_row, new_col = row + dr, col + dc
            if 0 <= new_row < 3 and 0 <= new_col < 3:
                new_state = [r[:] for r in state]
                new_state[row][col], new_state[new_row][new_col] =
↪new_state[new_row][new_col], new_state[row][col]
                neighbors.append(new_state)
        return neighbors

    goal_state = [[1, 2, 3], [4, 5, 6], [7, 8, 0]]
    stack = [(initial_state, [])]
    visited = set()

    while stack:
        current_state, path = stack.pop()
        state_tuple = tuple(map(tuple, current_state))  # Convert to tuple for
↪set
        if state_tuple in visited:
            continue
        visited.add(state_tuple)

        if current_state == goal_state:
            return path + [current_state]

        for neighbor in get_neighbors(current_state):
            stack.append((neighbor, path + [current_state]))

    return None  # No solution found

# Example usage:
initial_state = [[1, 2, 3], [4, 5, 6], [0, 7, 8]]
solution = solve_8puzzle_dfs(initial_state)

if solution:
    print("Solution found:")
    for state in solution:
        for row in state:
            print(row)
        print()
else:
    print("No solution found.")
```

Name:Vignesh Bhat

USN:1BM22CS327

```
Solution found:
[1, 2, 3]
[4, 5, 6]
[0, 7, 8]
```

```
[1, 2, 3]
[4, 5, 6]
[7, 0, 8]

[1, 2, 3]
[4, 5, 6]
[7, 8, 0]
```