Devesh Vengurlekar
Roll No: 9766
TE Comps A

AI Experiment 5

Aim : Eight puzzle game solution by A* algorithm

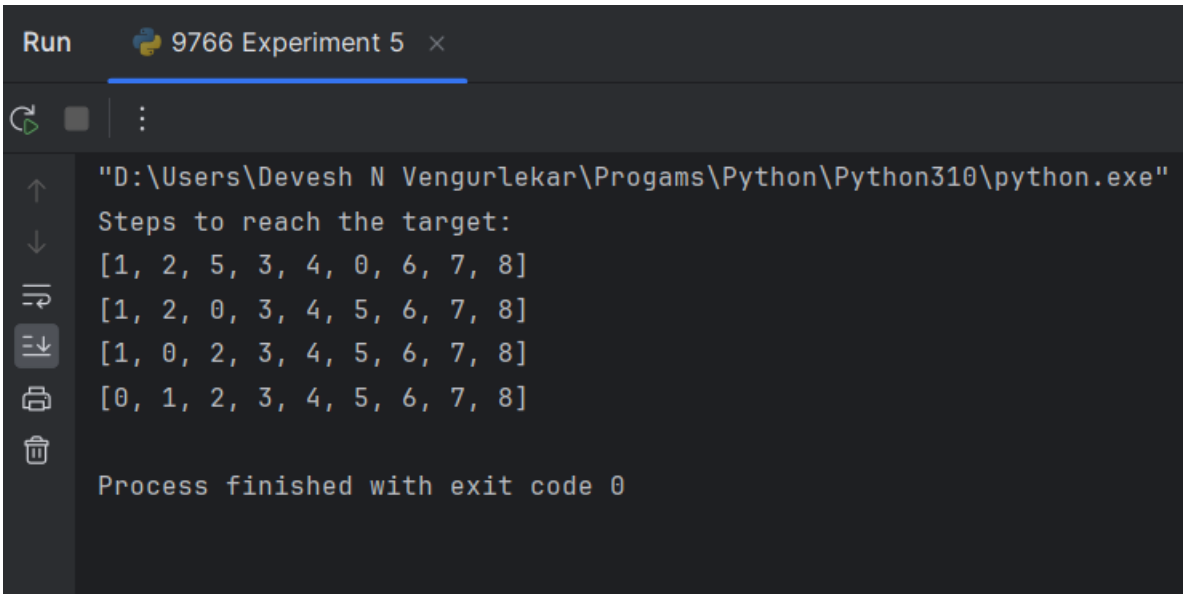
Program:

a) Water Jug Problem

```
# Devesh Vengurlekar
# Roll No: 9766
# TE Comps A

from queue import PriorityQueue

'''
i = Tile Number
b = Current Position
g = Target Position
'''
def h(puzzle, target):
    return sum(abs(b % 3 - g % 3) + abs(b // 3 - g // 3) for b, g in ((puzzle.index(i),
target.index(i)) for i in range(1, 9)))

def solve(puzzle, target):
    queue = PriorityQueue()
    queue.put((0, puzzle))
    came_from = {tuple(puzzle): None}
    cost_so_far = {tuple(puzzle): 0}

    while not queue.empty():
        _, current = queue.get()
        if current == target:
            path = []
            while current:
                path.append(current)
                current = came_from[tuple(current)]
            path.reverse()
            return path
```

```
        for new in neighbors(current):
            new_cost = cost_so_far[tuple(current)] + 1
            if tuple(new) not in cost_so_far or new_cost < cost_so_far[tuple(new)]:
                cost_so_far[tuple(new)] = new_cost
                priority = new_cost + h(new, target)
                queue.put((priority, new))
                came_from[tuple(new)] = current

def neighbors(current):
    neighbors = []
    i = current.index(0)
    if i in [3, 4, 5, 6, 7, 8]:
        neighbors.append(swap(list(current), i, i - 3))
    if i in [1, 2, 4, 5, 7, 8]:
        neighbors.append(swap(list(current), i, i - 1))
    if i in [0, 1, 3, 4, 6, 7]:
        neighbors.append(swap(list(current), i, i + 1))
    if i in [0, 1, 2, 3, 4, 5]:
        neighbors.append(swap(list(current), i, i + 3))
    return neighbors

def swap(puzzle, i, j):
    puzzle[i], puzzle[j] = puzzle[j], puzzle[i]
    return puzzle

puzzle = [1, 2, 5, 3, 4, 0, 6, 7, 8]
target = [0, 1, 2, 3, 4, 5, 6, 7, 8]

path = solve(puzzle, target)

if path:
    print("Steps to reach the target:")
    for i in path:
        print(i)
else:
    print("No solution found.")
```

Output:


Run
9766 Experiment 5
"D:\Users\Devesh N Vengurlekar\Progams\Python\Python310\python.exe"
Steps to reach the target:
[1, 2, 5, 3, 4, 0, 6, 7, 8]
[1, 2, 0, 3, 4, 5, 6, 7, 8]
[1, 0, 2, 3, 4, 5, 6, 7, 8]
[0, 1, 2, 3, 4, 5, 6, 7, 8]
Process finished with exit code 0