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Date : 26.04.2025

A* Search

Program:

```
import heapq

class Node:
    def __init__(self, position, parent=None, g=0, h=0):
        self.position = position
        self.parent = parent
        self.g = g
        self.h = h
        self.f = g + h

    def __lt__(self, other):
        return self.f < other.f

def heuristic(a, b):
    return abs(a[0] - b[0]) + abs(a[1] - b[1])

def a_star_search(grid, start, goal):
    open_list = []
    closed_set = set()

    start_node = Node(start, None, 0, heuristic(start, goal))
    heapq.heappush(open_list, start_node)

    while open_list:
        current_node = heapq.heappop(open_list)

        if current_node.position == goal:
            path = []
            while current_node:
                path.append(current_node.position)
                current_node = current_node.parent
            return path[::-1]

        closed_set.add(current_node.position)
```

```
        for move in [(0, 1), (1, 0), (0, -1), (-1, 0)]:
            new_position = (current_node.position[0] + move[0], current_node.position[1] + move[1])

            if new_position[0] < 0 or new_position[0] >= len(grid) or new_position[1] < 0 or
new_position[1] >= len(grid[0]):
                continue

            if grid[new_position[0]][new_position[1]] == 1 or new_position in closed_set:
                continue

            new_g = current_node.g + 1
            new_h = heuristic(new_position, goal)
            new_node = Node(new_position, current_node, new_g, new_h)

            heapq.heappush(open_list, new_node)

    return None

warehouse = [
    [0, 0, 0, 1, 0],
    [1, 1, 0, 1, 0],
    [0, 0, 0, 0, 0],
    [0, 1, 1, 1, 0],
    [0, 0, 0, 0, 0]
]

start_position = (0, 0)
goal_position = (4, 4)

path = a_star_search(warehouse, start_position, goal_position)

if path:
    print("Optimal Path:", path)
else:
    print("No Path Found")
```

Output :

```
Optimal Path: [(0, 0), (0, 1), (0, 2), (1, 2), (2, 2), (2, 3), (2, 4), (3, 4), (4, 4)]


** Process exited - Return Code: 0 **
Press Enter to exit terminal
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```