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A* SEARCH

CODE:

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class Node():
    """A node class for A* Pathfinding"""
    def __init__(self, parent=None, position=None):
        self.parent = parent
        self.position = position
        self.g = 0
        self.h = 0
        self.f = 0
    def __eq__(self, other):
        return self.position == other.position
def astar(maze, start, end):
    """Returns a list of tuples as a path from the given start
to the given end in the given maze"""
    # Create start and end node
    start_node = Node(None, start)
    start_node.g = start_node.h = start_node.f = 0
    end_node = Node(None, end)
    end_node.g = end_node.h = end_node.f = 0
    # Initialize both open and closed list
    open_list = []
    closed_list = []
    # Add the start node
    open_list.append(start_node)
    # Loop until you find the end
    while len(open_list) > 0:
        # Get the current node
        current_node = open_list[0]
        current_index = 0
        for index, item in enumerate(open_list):
            if item.f < current_node.f:
                current_node = item
                current_index = index
        # Pop current off open list, add to closed list
        open_list.pop(current_index)
        closed_list.append(current_node)
        # Found the goal
        if current_node == end_node:
            path = []
            current = current_node
            while current is not None:
                path.append(current.position)
                current = current.parent
            return path[::-1] # Return reversed path
        # Generate children
        children = []
        for new_position in [(0, -1), (0, 1), (-1, 0), (1, 0),
(-1, -1), (-1, 1), (1, -1), (1, 1)]: # Adjacent squares
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            # Get node position
            node_position = (current_node.position[0] +
new_position[0], current_node.position[1] + new_position[1])
            # Make sure within range
            if node_position[0] > (len(maze) - 1) or
node_position[0] < 0 or node_position[1] >
(len(maze[len(maze)-1]) -1) or node_position[1] < 0:
                continue
            # Make sure walkable terrain
            if maze[node_position[0]][node_position[1]] != 0:
                continue
            # Create new node
            new_node = Node(current_node, node_position)
            # Append
            children.append(new_node)
        # Loop through children
        for child in children:
            # Child is on the closed list
            for closed_child in closed_list:
                if child == closed_child:
                    continue
            # Create the f, g, and h values
            child.g = current_node.g + 1
            child.h = ((child.position[0] -
end_node.position[0]) ** 2) + ((child.position[1] -
end_node.position[1]) ** 2)
            child.f = child.g + child.h
            # Child is already in the open list
            for open_node in open_list:
                if child == open_node and child.g >
open_node.g:
                    continue
            # Add the child to the open list
            open_list.append(child)
if __name__ == '__main__':
    maze = [[0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 0, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 1, 0, 0, 0, 0, 0],
            [0, 0, 0, 0, 0, 0, 0, 0, 0, 0]]
    print("Maze is")
    for i in range(len(maze)):
        print(maze[i])
    start = (0, 0)
    end = (7, 6)
    print("Start at:",start)
```

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    print("End at:", end)
    path = astar(maze, start, end)
    print("Path is:",path)
```

OUTPUT:

```
OUTPUT:
 Maze is
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 1, 0, 0, 0, 0, 0]
[0, 0, 0, 0, 0, 0, 0, 0, 0, 0]
Start at: (0, 0)
End at: (7, 6)
Path is: [(0, 0), (1, 1), (2, 2), (3, 3), (4, 3), (5, 4), (6,
5), (7, 6)]
```