ARTIFICIAL INTELLIGENCE

EXPERIMENT NO: 5

DEVELOPING BEST FIRST SEARCH AND A*Algorithm FOR REAL WORLD PROBLEM

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Aim:

To develop best first search and A*algorithm for a real world problem.

Algorithm:

1. Initialize an array representing amaze with 0's and 1's.
2. Declare start and end points representing the top left and bottom right corner of the maze.
3. Initialize two array representing open_list and closed_list
4. Starting with the start point, check all the adjacent points.
5. If an adjacent point is a walkable terrain, check all its adjacent points, and keep track of the path.
6. Continue the process till you find the endpoint.
7. Print the path

Source Code:

```
class Node():
  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):
  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

open_list = []
closed_list = []

open_list.append(start_node)

while len(open_list)>0:

    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

    open_list.pop(current_index)
    closed_list.append(current_node)

    if current_node == end_node:
        path = []
        current = current_node
        while current is not None:

            path.append(current.position)
            current = current.parent
        return path[::-1]
```

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

            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

            if maze[node_position[0]][node_position[1]] != 0:
                continue
            new_node=Node(current_node,node_position)

            children.append(new_node)

        for child in children:
            for closed_child in closed_list:
                if child == closed_child:
                    continue
            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
            for open_node in open_list:
                if child == open_node and child.g > open_node.g:
                    continue
            open_list.append(child)

def main():
    maze=[[0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,1,0,0,0,0,0],
```

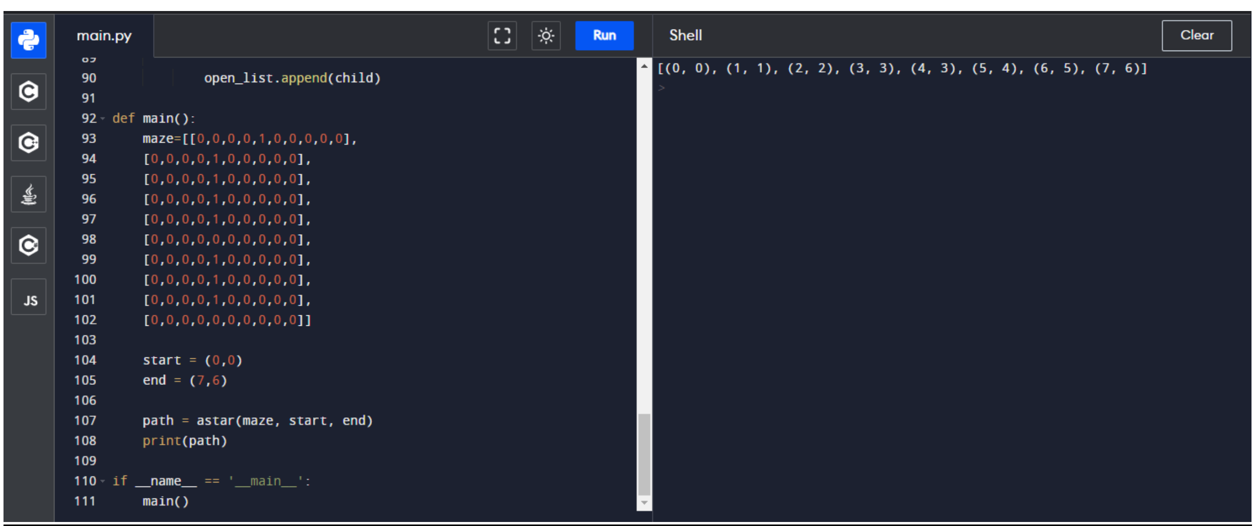
```
    [0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,0,0,0,0,0,0],
    [0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,1,0,0,0,0,0],
    [0,0,0,0,0,0,0,0,0,0]]

    start = (0,0)
    end = (7,6)

    path = astar(maze, start, end)
    print(path)

if __name__ == '__main__':
    main()
```

Output:



Result:

Thus an A* path finding algorithm was implemented for a real world problem.