**EXP:05 AO\* SEARCH ALGORITHM**

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importheapq

class Node:

def \_\_init\_\_(self, state, g\_value, h\_value, parent=None):

self.state = state

self.g\_value = g\_value

self.h\_value = h\_value

self.parent = parent

def\_value(self):

returnself.g\_value + self.h\_value

defao\_star\_search(initial\_state, is\_goal, successors, heuristic):

open\_list = [Node(initial\_state, 0, heuristic(initial\_state), None)]

closed\_set = set()

whileopen\_list:

open\_list.sort(key=lambda node: node.f\_value())

current\_node = open\_list.pop(0)

ifis\_goal(current\_node.state):

path = [] while current\_node:

path.append(current\_node.state) current\_node = current\_node.parent

return list(reversed(path)) closed\_set.add(current\_node.state)

forchild\_state in successors(current\_node.state):

ifchild\_state in closed\_set: continue g\_value = current\_node.g\_value + 1

h\_value = heuristic(child\_state) child\_node = Node(child\_state, g\_value, h\_value, current\_node)

for i, node in enumerate(open\_list):

ifnode.state == child\_state:

ifnode.g\_value>g\_value:

open\_list.pop(i)

break

elifnode.g\_value>g\_value:

open\_list.insert(i, child\_node)

break

else:

open\_list.append(child\_node)

return None

defis\_goal(state):

return state == (4, 4

def successors(state):

x, y = state return [(x + 1, y), (x, y + 1)]

def heuristic(state):

x, y = state

return abs(4 - x) + abs(4 - y)

if \_\_name\_\_ == "\_\_main\_\_":

initial\_state = (0, 0)

path = ao\_star\_search(initial\_state, is\_goal, successors, heuristic)

if path:

print("Path found:", path)

else:

print("No path found")

OUTPUT:

