AO* SEARCH ALGORITHM

PROGRAM:

```
import heapq
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 f_value(self):
return self.g_value + self.h_value
def ao_star_search(initial_state, is_goal, successors, heuristic):
open_list = [Node(initial_state, 0, heuristic(initial_state), None)]
closed_set = set()
```

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while open_list:
open_list.sort(key=lambda node: node.f_value())
current_node = open_list.pop(0)
if is_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)
for child_state in successors(current_node.state):
if child_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):
if node.state == child_state:
```

```
if node.g_value &gt; g_value:
open_list.pop(i)
break
elif node.g_value &gt; g_value:
open_list.insert(i, child_node)
break
else:
open_list.append(child_node)
return None
def is_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__ == &quot;__main__&quot;:
initial_state = (0, 0)
path = ao_star_search(initial_state, is_goal, successors, heuristic)
if path:
print(&quot;Path found:&quot;, path)
```

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else:
print(&quot;No path found&quot;)
```
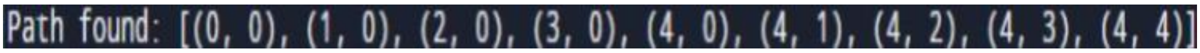

OUTPUT:



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