

## Raw Output

### Single Robot:

*Maze 1:*

BFS:

```
Mazeworld problem:
attempted with search method BFS
number of nodes visited: 215
solution length: 13
cost: 12
path: [(0, 0, 0), (0, 1, 0), (0, 2, 0), (0, 3, 0), (0, 3, 1), (0, 3, 2), (0, 4, 2), (
0, 5, 2), (0, 6, 2), (0, 6, 3), (0, 6, 4), (0, 6, 5), (0, 6, 6)]
```

A\* w/ `null_heuristic` (UCS):

```
Mazeworld problem:
attempted with search method Astar with heuristic null_heuristic
number of nodes visited: 215
solution length: 13
cost: 12
path: [(0, 0, 0), (0, 1, 0), (0, 2, 0), (0, 3, 0), (0, 4, 0), (0, 5, 0), (0, 5, 1), (
0, 5, 2), (0, 6, 2), (0, 6, 3), (0, 6, 4), (0, 6, 5), (0, 6, 6)]
```

A\* w/ `manhattan_heuristic`:

```
Mazeworld problem:
attempted with search method Astar with heuristic manhattan_heuristic
number of nodes visited: 185
solution length: 13
cost: 12
path: [(0, 0, 0), (0, 1, 0), (0, 2, 0), (0, 3, 0), (0, 4, 0), (0, 5, 0), (0, 6, 0), (
0, 6, 1), (0, 6, 2), (0, 6, 3), (0, 6, 4), (0, 6, 5), (0, 6, 6)]
```

A\* w/ optimized `manhattan_heuristic` ( `h(n)x2` ):

Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 106

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 2, 0), (0, 3, 0), (0, 4, 0), (0, 5, 0), (0, 5, 1), (0, 6, 1), (0, 6, 2), (0, 6, 3), (0, 6, 4), (0, 6, 5), (0, 6, 6)]

A\* w/ straight\_line\_heuristic :

Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 197

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 2, 2), (0, 2, 3), (0, 3, 3), (0, 3, 4), (0, 4, 4), (0, 5, 4), (0, 5, 5), (0, 6, 5), (0, 6, 6)]

A\* w/ optimized straight\_line\_heuristic (  $h(n) \times 2$  ):

Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 107

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 2, 2), (0, 3, 2), (0, 3, 3), (0, 4, 3), (0, 4, 4), (0, 5, 4), (0, 5, 5), (0, 6, 5), (0, 6, 6)]

*Maze 2*

BFS:

Mazeworld problem:

attempted with search method BFS

number of nodes visited: 604

solution length: 13

cost: 12

path: [(0, 0, 6), (0, 1, 6), (0, 2, 6), (0, 3, 6), (0, 4, 6), (0, 5, 6), (0, 6, 6), (0, 7, 6), (0, 8, 6), (0, 9, 6), (0, 10, 6), (0, 11, 6), (0, 12, 6)]

A\* w/ null\_heuristic (UCS):

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 595

solution length: 13

cost: 12

path: [(0, 0, 6), (0, 1, 6), (0, 2, 6), (0, 3, 6), (0, 4, 6), (0, 5, 6), (0, 6, 6), (0, 7, 6), (0, 8, 6), (0, 9, 6), (0, 10, 6), (0, 11, 6), (0, 12, 6)]

A\* w/ `manhattan_heuristic` :

Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 469

solution length: 13

cost: 12

path: [(0, 0, 6), (0, 1, 6), (0, 2, 6), (0, 3, 6), (0, 4, 6), (0, 5, 6), (0, 6, 6), (0, 7, 6), (0, 8, 6), (0, 9, 6), (0, 10, 6), (0, 11, 6), (0, 12, 6)]

A\* w/ `straight_line_heuristic` (also optimized version):

Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 303

solution length: 13

cost: 12

path: [(0, 0, 6), (0, 1, 6), (0, 2, 6), (0, 3, 6), (0, 4, 6), (0, 5, 6), (0, 6, 6), (0, 7, 6), (0, 8, 6), (0, 9, 6), (0, 10, 6), (0, 11, 6), (0, 12, 6)]

### Maze 3

BFS:

Mazeworld problem:

attempted with search method BFS

number of nodes visited: 133

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 2, 3), (0, 3, 3), (0, 4, 3), (0, 5, 3), (0, 6, 3), (0, 6, 4), (0, 6, 5), (0, 6, 6)]

A\* w/ `null_heuristic` (UCS):

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 131

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 2, 3), (0, 3, 3), (0, 4, 3), (0, 4, 4), (0, 4, 5), (0, 5, 5), (0, 6, 5), (0, 6, 6)]

A\* w/ `manhattan_heuristic` :

Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 95

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 2, 3), (0, 3, 3), (0, 4, 3), (0, 5, 3), (0, 5, 4), (0, 6, 4), (0, 6, 5), (0, 6, 6)]

A\* w/ optimized `manhattan_heuristic` ( `h(n)*2` ):

Mazeworld problem: Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 91

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 2, 3), (0, 3, 3), (0, 4, 3), (0, 5, 3), (0, 5, 4), (0, 6, 4), (0, 6, 5), (0, 6, 6)]

A\* w/ `straight_line_heuristic` :

Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 99

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 2, 3), (0, 3, 3), (0, 4, 3), (0, 4, 4), (0, 5, 4), (0, 5, 5), (0, 6, 5), (0, 6, 6)]

A\* w/ optimized `straight_line_heuristic` ( `h(n)*2` ):

Mazeworld problem: Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 91

solution length: 13

cost: 12

path: [(0, 0, 0), (0, 1, 0), (0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 2, 3), (0, 3, 3), (0, 4, 3), (0, 4, 4), (0, 5, 4), (0, 5, 5), (0, 6, 5), (0, 6, 6)]

## Multi Robot

### Maze 1

Mazeworld problem:

attempted with search method BFS

number of nodes visited: 74850

solution length: 23

cost: 20

path: [(0, 0, 3, 0, 2, 0, 1), (1, 0, 4, 0, 2, 0, 1), (2, 0, 4, 1, 2, 0, 1), (0, 0, 4, 1, 2, 1, 1), (1, 1, 4, 1, 2, 1, 1), (2, 1, 4, 2, 2, 1, 1), (0, 1, 4, 2, 2, 1, 2), (1, 1, 3, 2, 2, 1, 2), (2, 1, 3, 3, 2, 1, 2), (0, 1, 3, 3, 2, 2, 2), (1, 1, 2, 3, 2, 2, 2), (2, 1, 2, 4, 2, 2, 2), (0, 1, 2, 4, 2, 3, 2), (1, 2, 2, 4, 2, 3, 2), (2, 2, 2, 4, 3, 3, 2), (0, 2, 2, 4, 3, 4, 2), (1, 3, 2, 4, 3, 4, 2), (2, 3, 2, 4, 3, 4, 2), (0, 3, 2, 4, 3, 4, 1), (1, 3, 3, 4, 3, 4, 1), (2, 3, 3, 4, 2, 4, 1), (0, 3, 3, 4, 2, 4, 1), (1, 4, 3, 4, 2, 4, 1)]

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 76851

solution length: 25

cost: 16

path: [(0, 0, 3, 0, 2, 0, 1), (1, 0, 3, 0, 2, 0, 1), (2, 0, 3, 0, 2, 0, 1), (0, 0, 3, 0, 2, 1, 1), (1, 1, 3, 0, 2, 1, 1), (2, 1, 3, 0, 2, 1, 1), (0, 1, 3, 0, 2, 1, 2), (1, 1, 3, 0, 2, 1, 2), (2, 1, 3, 0, 2, 1, 2), (0, 1, 3, 0, 2, 2, 2), (1, 1, 2, 0, 2, 2, 2), (2, 1, 2, 0, 2, 2, 2), (0, 1, 2, 0, 2, 3, 2), (1, 2, 2, 0, 2, 3, 2), (2, 2, 2, 1, 2, 3, 2), (0, 2, 2, 1, 2, 3, 1), (1, 3, 2, 1, 2, 3, 1), (2, 3, 2, 2, 2, 3, 1), (0, 3, 2, 2, 2, 3, 1), (1, 4, 2, 2, 2, 3, 1), (2, 4, 2, 3, 2, 3, 1), (0, 4, 2, 3, 2, 3, 1), (1, 4, 3, 3, 2, 3, 1), (2, 4, 3, 4, 2, 3, 1), (0, 4, 3, 4, 2, 4, 1)]

Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 21058

solution length: 26

cost: 18

path: [(0, 0, 3, 0, 2, 0, 1), (1, 1, 3, 0, 2, 0, 1), (2, 1, 3, 0, 2, 0, 1), (0, 1, 3,

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0, 2, 0, 1), (1, 1, 2, 0, 2, 0, 1), (2, 1, 2, 0, 2, 0, 1), (0, 1, 2, 0, 2, 0, 1), (1, 2, 2, 0, 2, 0, 1), (2, 2, 2, 1, 2, 0, 1), (0, 2, 2, 1, 2, 1, 1), (1, 3, 2, 1, 2, 1, 1), (2, 3, 2, 2, 2, 1, 1), (0, 3, 2, 2, 2, 1, 2), (1, 3, 3, 2, 2, 1, 2), (2, 3, 3, 3, 2, 1, 2), (0, 3, 3, 3, 2, 2, 2), (1, 3, 4, 3, 2, 2, 2), (2, 3, 4, 4, 2, 2, 2), (0, 3, 4, 4, 2, 3, 2), (1, 3, 4, 4, 2, 3, 2), (2, 3, 4, 4, 2, 3, 2), (0, 3, 4, 4, 2, 3, 1), (1, 4, 4, 4, 2, 3, 1), (2, 4, 4, 4, 2, 3, 1), (0, 4, 4, 4, 2, 4, 1), (1, 4, 3, 4, 2, 4, 1)]
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Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 21269

solution length: 25

cost: 16

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

## Maze 2

Mazeworld problem:

attempted with search method BFS

number of nodes visited: 9359702

solution length: 81

cost: 77

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path: [(0, 0, 0, 1, 0, 7, 7), (1, 0, 1, 1, 0, 7, 7), (2, 0, 1, 0, 0, 7, 7), (0, 0, 1, 0, 0, 7, 6), (1, 0, 2, 0, 0, 7, 6), (2, 0, 2, 1, 0, 7, 6), (0, 0, 2, 1, 0, 7, 7), (1, 0, 3, 1, 0, 7, 7), (2, 0, 3, 2, 0, 7, 7), (0, 0, 3, 2, 0, 7, 6), (1, 0, 4, 2, 0, 7, 6), (2, 0, 4, 2, 1, 7, 6), (0, 0, 4, 2, 1, 6, 6), (1, 1, 4, 2, 1, 6, 6), (2, 1, 4, 2, 2, 6, 6), (0, 1, 4, 2, 2, 7, 6), (1, 2, 4, 2, 2, 7, 6), (2, 2, 4, 2, 3, 7, 6), (0, 2, 4, 2, 3, 7, 7), (1, 3, 4, 2, 3, 7, 7), (2, 3, 4, 3, 3, 7, 7), (0, 3, 4, 3, 3, 7, 6), (1, 4, 4, 3, 3, 7, 6), (2, 4, 4, 3, 4, 7, 6), (0, 4, 4, 3, 4, 6, 6), (1, 5, 4, 3, 4, 6, 6), (2, 5, 4, 4, 4, 6, 6), (0, 5, 4, 4, 4, 6, 5), (1, 6, 4, 4, 4, 6, 5), (2, 6, 4, 4, 5, 6, 5), (0, 6, 4, 4, 5, 5, 5), (1, 7, 4, 4, 5, 5, 5), (2, 7, 4, 4, 6, 5, 5), (0, 7, 4, 4, 6, 5, 6), (1, 7, 5, 4, 6, 5, 6), (2, 7, 5, 4, 7, 5, 6), (0, 7, 5, 4, 7, 5, 5), (1, 7, 6, 4, 7, 5, 5), (2, 7, 6, 4, 8, 5, 5), (0, 7, 6, 4, 8, 4, 5), (1, 7, 7, 4, 8, 4, 5), (2, 7, 7, 5, 8, 4, 5), (0, 7, 7, 5, 8, 4, 4), (1, 7, 8, 5, 8, 4, 4), (2, 7, 8, 5, 9, 4, 4), (0, 7, 8, 5, 9, 4, 4), (1, 7, 9, 5, 9, 4, 4), (2, 7, 9, 6, 9, 4, 4), (0, 7, 9, 6, 9, 4, 4), (1, 8, 9, 6, 9, 4, 4), (2, 8, 9, 7, 9, 4, 4), (0, 8, 9, 7, 9, 4, 4), (1, 9, 9, 7, 9, 4, 4), (2, 9, 9, 8, 9, 4, 4), (0, 9, 9, 8, 9, 4, 5), (1, 9, 8, 8, 9, 4, 5), (2, 9, 8, 9, 9, 4, 5), (0, 9, 8, 9, 9, 5, 5), (1, 9, 7, 9, 9, 5, 5), (2, 9, 7, 9, 8, 5, 5), (0, 9, 7, 9, 8, 6, 5), (1, 9, 6, 9, 8, 6, 5), (2, 9, 6, 9,
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7, 6, 5), (0, 9, 6, 9, 7, 7, 5), (1, 9, 5, 9, 7, 7, 5), (2, 9, 5, 9, 6, 7, 5), (0, 9, 5, 9, 6, 7, 6), (1, 9, 4, 9, 6, 7, 6), (2, 9, 4, 9, 5, 7, 6), (0, 9, 4, 9, 5, 7, 7), (1, 9, 3, 9, 5, 7, 7), (2, 9, 3, 9, 4, 7, 7), (0, 9, 3, 9, 4, 7, 8), (1, 9, 2, 9, 4, 7, 8), (2, 9, 2, 9, 3, 7, 8), (0, 9, 2, 9, 3, 7, 9), (1, 9, 1, 9, 3, 7, 9), (2, 9, 1, 9, 2, 7, 9), (0, 9, 1, 9, 2, 8, 9), (1, 9, 0, 9, 2, 8, 9), (2, 9, 0, 9, 1, 8, 9)]
```

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 9362725

solution length: 81

cost: 55

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path: [(0, 0, 0, 1, 0, 7, 7), (1, 0, 1, 1, 0, 7, 7), (2, 0, 1, 1, 0, 7, 7), (0, 0, 1, 1, 0, 7, 7), (1, 0, 2, 1, 0, 7, 7), (2, 0, 2, 1, 0, 7, 7), (0, 0, 2, 1, 0, 7, 7), (1, 0, 3, 1, 0, 7, 7), (2, 0, 3, 2, 0, 7, 7), (0, 0, 3, 2, 0, 7, 7), (1, 0, 4, 2, 0, 7, 7), (2, 0, 4, 3, 0, 7, 7), (0, 0, 4, 3, 0, 7, 7), (1, 0, 5, 3, 0, 7, 7), (2, 0, 5, 4, 0, 7, 7), (0, 0, 5, 4, 0, 7, 7), (1, 0, 6, 4, 0, 7, 7), (2, 0, 6, 4, 1, 7, 7), (0, 0, 6, 4, 1, 7, 7), (1, 0, 7, 4, 1, 7, 7), (2, 0, 7, 4, 2, 7, 7), (0, 0, 7, 4, 2, 7, 7), (1, 1, 7, 4, 2, 7, 7), (2, 1, 7, 4, 3, 7, 7), (0, 1, 7, 4, 3, 7, 7), (1, 1, 8, 4, 3, 7, 7), (2, 1, 8, 4, 4, 7, 7), (0, 1, 8, 4, 4, 7, 7), (1, 2, 8, 4, 4, 7, 7), (2, 2, 8, 5, 4, 7, 7), (0, 2, 8, 5, 4, 7, 7), (1, 3, 8, 5, 4, 7, 7), (2, 3, 8, 5, 5, 7, 7), (0, 3, 8, 5, 5, 7, 7), (1, 4, 8, 5, 5, 7, 7), (2, 4, 8, 5, 6, 7, 7), (0, 4, 8, 5, 6, 7, 7), (1, 5, 8, 5, 6, 7, 7), (2, 5, 8, 5, 7, 7, 7), (0, 5, 8, 5, 7, 7, 7), (1, 6, 8, 5, 7, 7, 7), (2, 6, 8, 6, 7, 7, 7), (0, 6, 8, 6, 7, 7, 7), (1, 7, 8, 6, 7, 7, 7), (2, 7, 8, 6, 8, 7, 7), (0, 7, 8, 6, 8, 7, 7), (1, 7, 9, 6, 8, 7, 7), (2, 7, 9, 7, 8, 7, 7), (0, 7, 9, 7, 8, 7, 7), (1, 8, 9, 7, 8, 7, 7), (2, 8, 9, 7, 9, 7, 7), (0, 8, 9, 7, 9, 7, 7), (1, 9, 9, 7, 9, 7, 7), (2, 9, 9, 8, 9, 7, 7), (0, 9, 9, 8, 9, 7, 7), (1, 9, 8, 8, 9, 7, 7), (2, 9, 8, 9, 9, 7, 7), (0, 9, 8, 9, 9, 7, 7), (1, 9, 7, 9, 9, 7, 7), (2, 9, 7, 9, 8, 7, 7), (0, 9, 7, 9, 8, 7, 7), (1, 9, 6, 9, 8, 7, 7), (2, 9, 6, 9, 7, 7, 7), (0, 9, 6, 9, 7, 7, 7), (1, 9, 5, 9, 7, 7, 7), (2, 9, 5, 9, 6, 7, 7), (0, 9, 5, 9, 6, 7, 7), (1, 9, 4, 9, 6, 7, 7), (2, 9, 4, 9, 5, 7, 7), (0, 9, 4, 9, 5, 7, 7), (1, 9, 3, 9, 5, 7, 7), (2, 9, 3, 9, 4, 7, 7), (0, 9, 3, 9, 4, 7, 8), (1, 9, 2, 9, 4, 7, 8), (2, 9, 2, 9, 3, 7, 8), (0, 9, 2, 9, 3, 7, 9), (1, 9, 1, 9, 3, 7, 9), (2, 9, 1, 9, 2, 7, 9), (0, 9, 1, 9, 2, 8, 9), (1, 9, 0, 9, 2, 8, 9), (2, 9, 0, 9, 1, 8, 9)]
```

Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 5761782

solution length: 115

cost: 55

```
path: [(0, 0, 0, 1, 0, 7, 7), (1, 0, 0, 1, 0, 7, 7), (2, 0, 0, 1, 1, 7, 7), (0, 0, 0, 1, 1, 7, 7), (1, 1, 0, 1, 1, 7, 7), (2, 1, 0, 1, 1, 7, 7), (0, 1, 0, 1, 1, 7, 7), (1, 2, 0, 1, 1, 7, 7), (2, 2, 0, 2, 1, 7, 7), (0, 2, 0, 2, 1, 7, 7), (1, 3, 0, 2, 1, 7, 7), (2, 3, 0, 3, 1, 7, 7), (0, 3, 0, 3, 1, 7, 7), (1, 3, 0, 3, 1, 7, 7), (2, 3, 0, 4, 1, 7, 7), (0, 3, 0, 4, 1, 7, 7), (1, 3, 0, 4, 1, 7, 7), (2, 3, 0, 5, 1, 7, 7), (0, 3, 0, 5, 1, 7, 7), (1, 3, 0, 5, 1, 7, 7), (2, 3, 0, 5, 2, 7, 7), (0, 3, 0, 5, 2, 7, 7)
```

), (1, 4, 0, 5, 2, 7, 7), (2, 4, 0, 6, 2, 7, 7), (0, 4, 0, 6, 2, 7, 7), (1, 4, 1, 6, 2, 7, 7), (2, 4, 1, 6, 3, 7, 7), (0, 4, 1, 6, 3, 7, 7), (1, 5, 1, 6, 3, 7, 7), (2, 5, 1, 6, 3, 7, 7), (0, 5, 1, 6, 3, 7, 7), (1, 6, 1, 6, 3, 7, 7), (2, 6, 1, 6, 3, 7, 7), (0, 6, 1, 6, 3, 7, 7), (1, 6, 2, 6, 3, 7, 7), (2, 6, 2, 6, 4, 7, 7), (0, 6, 2, 6, 4, 7, 7), (1, 6, 3, 6, 4, 7, 7), (2, 6, 3, 6, 5, 7, 7), (0, 6, 3, 6, 5, 7, 7), (1, 6, 4, 6, 5, 7, 7), (2, 6, 4, 6, 6, 7, 7), (0, 6, 4, 6, 6, 7, 7), (1, 6, 5, 6, 6, 7, 7), (2, 6, 5, 6, 7, 7, 7), (0, 6, 5, 6, 7, 7, 7), (1, 6, 6, 6, 7, 7, 7), (2, 6, 6, 6, 8, 7, 7), (0, 6, 6, 6, 8, 7, 7), (1, 6, 7, 6, 8, 7, 7), (2, 6, 7, 7, 8, 7, 7), (0, 6, 7, 7, 8, 7, 7), (1, 6, 8, 7, 8, 7, 7), (2, 6, 8, 7, 8, 7, 7), (0, 6, 8, 7, 8, 7, 7), (1, 6, 9, 7, 8, 7, 7), (2, 6, 9, 7, 8, 7, 7), (0, 6, 9, 7, 8, 7, 7), (1, 7, 9, 7, 8, 7, 7), (2, 7, 9, 7, 8, 7, 7), (0, 7, 9, 7, 8, 7, 7), (1, 8, 9, 7, 8, 7, 7), (2, 8, 9, 7, 8, 7, 7), (0, 8, 9, 7, 8, 7, 7), (1, 9, 9, 7, 8, 7, 7), (2, 9, 9, 7, 8, 7, 7), (0, 9, 9, 7, 8, 7, 7), (1, 9, 8, 7, 8, 7, 7), (2, 9, 8, 7, 8, 7, 7), (0, 9, 8, 7, 8, 7, 7), (1, 9, 7, 7, 8, 7, 7), (2, 9, 7, 7, 8, 7, 7), (0, 9, 7, 7, 8, 7, 7), (1, 9, 6, 7, 8, 7, 7), (2, 9, 6, 7, 8, 7, 7), (0, 9, 6, 7, 8, 7, 7), (1, 9, 5, 7, 8, 7, 7), (2, 9, 5, 7, 8, 7, 7), (0, 9, 5, 7, 8, 7, 7), (1, 9, 4, 7, 8, 7, 7), (2, 9, 4, 7, 8, 7, 7), (0, 9, 4, 7, 8, 7, 7), (1, 9, 3, 7, 8, 7, 7), (2, 9, 3, 7, 9, 7, 7), (0, 9, 3, 7, 9, 7, 7), (1, 9, 2, 7, 9, 7, 7), (2, 9, 2, 8, 9, 7, 7), (0, 9, 2, 8, 9, 7, 7), (1, 9, 1, 8, 9, 7, 7), (2, 9, 1, 9, 9, 7, 7), (0, 9, 1, 9, 9, 7, 7), (1, 9, 0, 9, 9, 7, 7), (2, 9, 0, 9, 8, 7, 7), (0, 9, 0, 9, 8, 7, 8), (1, 9, 0, 9, 8, 7, 8), (2, 9, 0, 9, 7, 7, 8), (0, 9, 0, 9, 7, 7, 9), (1, 9, 0, 9, 7, 7, 9), (2, 9, 0, 9, 6, 7, 9), (0, 9, 0, 9, 6, 7, 9), (1, 9, 0, 9, 6, 7, 9), (2, 9, 0, 9, 5, 7, 9), (0, 9, 0, 9, 5, 7, 9), (1, 9, 0, 9, 5, 7, 9), (2, 9, 0, 9, 4, 7, 9), (0, 9, 0, 9, 4, 7, 9), (1, 9, 0, 9, 4, 7, 9), (2, 9, 0, 9, 3, 7, 9), (0, 9, 0, 9, 3, 7, 9), (1, 9, 0, 9, 3, 7, 9), (2, 9, 0, 9, 2, 7, 9), (0, 9, 0, 9, 2, 7, 9), (1, 9, 0, 9, 2, 7, 9), (2, 9, 0, 9, 1, 7, 9), (0, 9, 0, 9, 1, 8, 9)]

Mazeworld problem:

attempted with search method Astar with heuristic straight\_line\_heuristic

number of nodes visited: 7783268

solution length: 96

cost: 55

path: [(0, 0, 0, 1, 0, 7, 7), (1, 0, 0, 1, 0, 7, 7), (2, 0, 0, 2, 0, 7, 7), (0, 0, 0, 2, 0, 7, 7), (1, 1, 0, 2, 0, 7, 7), (2, 1, 0, 3, 0, 7, 7), (0, 1, 0, 3, 0, 7, 7), (1, 2, 0, 3, 0, 7, 7), (2, 2, 0, 4, 0, 7, 7), (0, 2, 0, 4, 0, 7, 7), (1, 3, 0, 4, 0, 7, 7), (2, 3, 0, 4, 0, 7, 7), (0, 3, 0, 4, 0, 7, 7), (1, 3, 1, 4, 0, 7, 7), (2, 3, 1, 4, 0, 7, 7), (0, 3, 1, 4, 0, 7, 7), (1, 4, 1, 4, 0, 7, 7), (2, 4, 1, 5, 0, 7, 7), (0, 4, 1, 5, 0, 7, 7), (1, 5, 1, 5, 0, 7, 7), (2, 5, 1, 6, 0, 7, 7), (0, 5, 1, 6, 0, 7, 7), (1, 6, 1, 6, 0, 7, 7), (2, 6, 1, 6, 0, 7, 7), (0, 6, 1, 6, 0, 7, 7), (1, 6, 2, 6, 0, 7, 7), (2, 6, 2, 6, 1, 7, 7), (0, 6, 2, 6, 1, 7, 7), (1, 6, 3, 6, 1, 7, 7), (2, 6, 3, 6, 1, 7, 7), (0, 6, 3, 6, 1, 7, 7), (1, 6, 4, 6, 1, 7, 7), (2, 6, 4, 6, 2, 7, 7), (0, 6, 4, 6, 2, 7, 7), (1, 6, 5, 6, 2, 7, 7), (2, 6, 5, 6, 3, 7, 7), (0, 6, 5, 6, 3, 7, 7), (1, 6, 6, 6, 3, 7, 7), (2, 6, 6, 6, 4, 7, 7), (0, 6, 6, 6, 4, 7, 7), (1, 6, 7, 6, 4, 7, 7), (2, 6, 7, 6, 5, 7, 7), (0, 6, 7, 6, 5, 7, 7), (1, 6, 8, 6, 5, 7, 7), (2, 6, 8, 6, 6, 7, 7), (0, 6, 8, 6, 6, 7, 7), (1, 7, 8, 6, 6, 7, 7), (2, 7, 8, 6, 7, 7





```
8), (1, 0, 5, 0, 7, 0, 8), (2, 0, 5, 0, 6, 0, 8), (0, 0, 5, 0, 6, 0, 7), (1, 0, 4, 0, 6, 0, 7), (2, 0, 4, 0, 5, 0, 7), (0, 0, 4, 0, 5, 0, 6), (1, 0, 3, 0, 5, 0, 6), (2, 0, 3, 0, 4, 0, 6), (0, 0, 3, 0, 4, 0, 5), (1, 0, 2, 0, 4, 0, 5), (2, 0, 2, 0, 3, 0, 5), (0, 0, 2, 0, 3, 0, 4), (1, 0, 1, 0, 3, 0, 4), (2, 0, 1, 0, 2, 0, 4), (0, 0, 1, 0, 2, 0, 3), (1, 0, 0, 0, 2, 0, 3), (2, 0, 0, 0, 1, 0, 3), (0, 0, 0, 0, 1, 0, 2)]
```

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 609120

solution length: 94

cost: 85

```
path: [(0, 0, 17, 0, 16, 0, 15), (1, 0, 18, 0, 16, 0, 15), (2, 0, 18, 0, 17, 0, 15), (0, 0, 18, 0, 17, 0, 15), (1, 0, 19, 0, 17, 0, 15), (2, 0, 19, 0, 18, 0, 15), (0, 0, 19, 0, 18, 0, 15), (1, 1, 19, 0, 18, 0, 15), (2, 1, 19, 0, 19, 0, 15), (0, 1, 19, 0, 19, 0, 16), (1, 2, 19, 0, 19, 0, 16), (2, 2, 19, 1, 19, 0, 16), (0, 2, 19, 1, 19, 0, 17), (1, 3, 19, 1, 19, 0, 17), (2, 3, 19, 2, 19, 0, 17), (0, 3, 19, 2, 19, 0, 18), (1, 3, 19, 2, 19, 0, 18), (2, 3, 19, 2, 18, 0, 18), (0, 3, 19, 2, 18, 0, 19), (1, 2, 19, 2, 18, 0, 19), (2, 2, 19, 2, 17, 0, 19), (0, 2, 19, 2, 17, 1, 19), (1, 2, 18, 2, 17, 1, 19), (2, 2, 18, 2, 17, 1, 19), (0, 2, 18, 2, 17, 2, 19), (1, 2, 18, 2, 17, 2, 19), (2, 2, 18, 2, 17, 2, 19), (0, 2, 18, 2, 17, 3, 19), (1, 2, 19, 2, 17, 3, 19), (2, 2, 19, 2, 18, 3, 19), (0, 2, 19, 2, 18, 3, 19), (1, 1, 19, 2, 18, 3, 19), (2, 1, 19, 2, 19, 3, 19), (0, 1, 19, 2, 19, 3, 19), (1, 0, 19, 2, 19, 3, 19), (2, 0, 19, 1, 19, 3, 19), (0, 0, 19, 1, 19, 2, 19), (1, 0, 18, 1, 19, 2, 19), (2, 0, 18, 0, 19, 2, 19), (0, 0, 18, 0, 19, 1, 19), (1, 0, 17, 0, 19, 1, 19), (2, 0, 17, 0, 18, 1, 19), (0, 0, 17, 0, 18, 0, 19), (1, 0, 16, 0, 18, 0, 19), (2, 0, 16, 0, 17, 0, 19), (0, 0, 16, 0, 17, 0, 18), (1, 0, 15, 0, 17, 0, 18), (2, 0, 15, 0, 16, 0, 18), (0, 0, 15, 0, 16, 0, 17), (1, 0, 14, 0, 16, 0, 17), (2, 0, 14, 0, 15, 0, 17), (0, 0, 14, 0, 15, 0, 16), (1, 0, 13, 0, 15, 0, 16), (2, 0, 13, 0, 14, 0, 16), (0, 0, 13, 0, 14, 0, 15), (1, 0, 12, 0, 14, 0, 15), (2, 0, 12, 0, 13, 0, 15), (0, 0, 12, 0, 13, 0, 14), (1, 0, 11, 0, 13, 0, 14), (2, 0, 11, 0, 12, 0, 14), (0, 0, 11, 0, 12, 0, 13), (1, 0, 10, 0, 12, 0, 13), (2, 0, 10, 0, 11, 0, 13), (0, 0, 10, 0, 11, 0, 12), (1, 0, 9, 0, 11, 0, 12), (2, 0, 9, 0, 10, 0, 12), (0, 0, 9, 0, 10, 0, 11), (1, 0, 8, 0, 10, 0, 11), (2, 0, 8, 0, 9, 0, 11), (0, 0, 8, 0, 9, 0, 10), (1, 0, 7, 0, 9, 0, 10), (2, 0, 7, 0, 8, 0, 10), (0, 0, 7, 0, 8, 0, 9), (1, 0, 6, 0, 8, 0, 9), (2, 0, 6, 0, 7, 0, 9), (0, 0, 6, 0, 7, 0, 8), (1, 0, 5, 0, 7, 0, 8), (2, 0, 5, 0, 6, 0, 8), (0, 0, 5, 0, 6, 0, 7), (1, 0, 4, 0, 6, 0, 7), (2, 0, 4, 0, 5, 0, 7), (0, 0, 4, 0, 5, 0, 6), (1, 0, 3, 0, 5, 0, 6), (2, 0, 3, 0, 4, 0, 6), (0, 0, 3, 0, 4, 0, 5), (1, 0, 2, 0, 4, 0, 5), (2, 0, 2, 0, 3, 0, 5), (0, 0, 2, 0, 3, 0, 4), (1, 0, 1, 0, 3, 0, 4), (2, 0, 1, 0, 2, 0, 4), (0, 0, 1, 0, 2, 0, 3), (1, 0, 0, 0, 2, 0, 3), (2, 0, 0, 0, 1, 0, 3), (0, 0, 0, 0, 1, 0, 2)]
```

Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 236976

solution length: 151

cost: 85

```
path: [(0, 0, 17, 0, 16, 0, 15), (1, 0, 18, 0, 16, 0, 15), (2, 0, 18, 0, 17, 0, 15),
(0, 0, 18, 0, 17, 0, 15), (1, 0, 19, 0, 17, 0, 15), (2, 0, 19, 0, 18, 0, 15), (0, 0,
19, 0, 18, 0, 15), (1, 1, 19, 0, 18, 0, 15), (2, 1, 19, 0, 19, 0, 15), (0, 1, 19, 0,
19, 0, 16), (1, 2, 19, 0, 19, 0, 16), (2, 2, 19, 1, 19, 0, 16), (0, 2, 19, 1, 19, 0,
17), (1, 3, 19, 1, 19, 0, 17), (2, 3, 19, 2, 19, 0, 17), (0, 3, 19, 2, 19, 0, 18), (1
, 3, 19, 2, 19, 0, 18), (2, 3, 19, 2, 18, 0, 18), (0, 3, 19, 2, 18, 0, 19), (1, 3, 19
, 2, 18, 0, 19), (2, 3, 19, 2, 18, 0, 19), (0, 3, 19, 2, 18, 1, 19), (1, 3, 19, 2, 18
, 1, 19), (2, 3, 19, 2, 18, 1, 19), (0, 3, 19, 2, 18, 2, 19), (1, 3, 19, 2, 18, 2, 19
), (2, 3, 19, 2, 17, 2, 19), (0, 3, 19, 2, 17, 2, 18), (1, 2, 19, 2, 17, 2, 18), (2,
2, 19, 2, 17, 2, 18), (0, 2, 19, 2, 17, 2, 18), (1, 1, 19, 2, 17, 2, 18), (2, 1, 19,
2, 17, 2, 18), (0, 1, 19, 2, 17, 2, 18), (1, 0, 19, 2, 17, 2, 18), (2, 0, 19, 2, 17,
2, 18), (0, 0, 19, 2, 17, 2, 18), (1, 0, 18, 2, 17, 2, 18), (2, 0, 18, 2, 17, 2, 18),
(0, 0, 18, 2, 17, 2, 18), (1, 0, 17, 2, 17, 2, 18), (2, 0, 17, 2, 17, 2, 18), (0, 0,
17, 2, 17, 2, 18), (1, 0, 16, 2, 17, 2, 18), (2, 0, 16, 2, 17, 2, 18), (0, 0, 16, 2,
17, 2, 18), (1, 0, 15, 2, 17, 2, 18), (2, 0, 15, 2, 17, 2, 18), (0, 0, 15, 2, 17, 2,
18), (1, 0, 14, 2, 17, 2, 18), (2, 0, 14, 2, 17, 2, 18), (0, 0, 14, 2, 17, 2, 18), (
1, 0, 13, 2, 17, 2, 18), (2, 0, 13, 2, 17, 2, 18), (0, 0, 13, 2, 17, 2, 18), (1, 0, 1
2, 2, 17, 2, 18), (2, 0, 12, 2, 17, 2, 18), (0, 0, 12, 2, 17, 2, 18), (1, 0, 11, 2, 1
7, 2, 18), (2, 0, 11, 2, 17, 2, 18), (0, 0, 11, 2, 17, 2, 18), (1, 0, 10, 2, 17, 2, 1
8), (2, 0, 10, 2, 17, 2, 18), (0, 0, 10, 2, 17, 2, 18), (1, 0, 9, 2, 17, 2, 18), (2,
0, 9, 2, 17, 2, 18), (0, 0, 9, 2, 17, 2, 19), (1, 0, 9, 2, 17, 2, 19), (2, 0, 9, 2, 1
8, 2, 19), (0, 0, 9, 2, 18, 3, 19), (1, 0, 8, 2, 18, 3, 19), (2, 0, 8, 2, 19, 3, 19),
(0, 0, 8, 2, 19, 3, 19), (1, 0, 7, 2, 19, 3, 19), (2, 0, 7, 1, 19, 3, 19), (0, 0, 7,
1, 19, 2, 19), (1, 0, 6, 1, 19, 2, 19), (2, 0, 6, 0, 19, 2, 19), (0, 0, 6, 0, 19, 1,
19), (1, 0, 6, 0, 19, 1, 19), (2, 0, 6, 0, 18, 1, 19), (0, 0, 6, 0, 18, 0, 19), (1,
0, 5, 0, 18, 0, 19), (2, 0, 5, 0, 17, 0, 19), (0, 0, 5, 0, 17, 0, 19), (1, 0, 4, 0, 1
7, 0, 19), (2, 0, 4, 0, 16, 0, 19), (0, 0, 4, 0, 16, 0, 18), (1, 0, 3, 0, 16, 0, 18),
(2, 0, 3, 0, 16, 0, 18), (0, 0, 3, 0, 16, 0, 17), (1, 0, 2, 0, 16, 0, 17), (2, 0, 2,
0, 15, 0, 17), (0, 0, 2, 0, 15, 0, 16), (1, 0, 1, 0, 15, 0, 16), (2, 0, 1, 0, 14, 0,
16), (0, 0, 1, 0, 14, 0, 15), (1, 0, 1, 0, 14, 0, 15), (2, 0, 1, 0, 13, 0, 15), (0,
0, 1, 0, 13, 0, 14), (1, 0, 1, 0, 13, 0, 14), (2, 0, 1, 0, 12, 0, 14), (0, 0, 1, 0, 1
2, 0, 13), (1, 0, 1, 0, 12, 0, 13), (2, 0, 1, 0, 11, 0, 13), (0, 0, 1, 0, 11, 0, 13),
(1, 0, 1, 0, 11, 0, 13), (2, 0, 1, 0, 10, 0, 13), (0, 0, 1, 0, 10, 0, 13), (1, 0, 0,
0, 10, 0, 13), (2, 0, 0, 0, 9, 0, 13), (0, 0, 0, 0, 9, 0, 13), (1, 0, 0, 0, 9, 0, 13
), (2, 0, 0, 0, 8, 0, 13), (0, 0, 0, 0, 8, 0, 12), (1, 0, 0, 0, 8, 0, 12), (2, 0, 0,
0, 7, 0, 12), (0, 0, 0, 0, 7, 0, 11), (1, 0, 0, 0, 7, 0, 11), (2, 0, 0, 0, 6, 0, 11),
(0, 0, 0, 0, 6, 0, 10), (1, 0, 0, 0, 6, 0, 10), (2, 0, 0, 0, 5, 0, 10), (0, 0, 0, 0,
5, 0, 9), (1, 0, 0, 0, 5, 0, 9), (2, 0, 0, 0, 4, 0, 9), (0, 0, 0, 0, 4, 0, 9), (1, 0
, 0, 0, 4, 0, 9), (2, 0, 0, 0, 3, 0, 9), (0, 0, 0, 0, 3, 0, 9), (1, 0, 0, 0, 3, 0, 9)
, (2, 0, 0, 0, 2, 0, 9), (0, 0, 0, 0, 2, 0, 8), (1, 0, 0, 0, 2, 0, 8), (2, 0, 0, 0, 2
, 0, 8), (0, 0, 0, 0, 2, 0, 7), (1, 0, 0, 0, 2, 0, 7), (2, 0, 0, 0, 2, 0, 7), (0, 0,
0, 0, 2, 0, 6), (1, 0, 0, 0, 2, 0, 6), (2, 0, 0, 0, 1, 0, 6), (0, 0, 0, 0, 1, 0, 5),
(1, 0, 0, 0, 1, 0, 5), (2, 0, 0, 0, 1, 0, 5), (0, 0, 0, 0, 1, 0, 4), (1, 0, 0, 0, 1,
0, 4), (2, 0, 0, 0, 1, 0, 4), (0, 0, 0, 0, 1, 0, 3), (1, 0, 0, 0, 1, 0, 3), (2, 0, 0,
0, 1, 0, 3), (0, 0, 0, 0, 1, 0, 2)]
```

```
attempted with search method Astar with heuristic straight_line_heuristic
number of nodes visited: 472786
solution length: 145
cost: 85
```

```
path: [(0, 0, 17, 0, 16, 0, 15), (1, 0, 18, 0, 16, 0, 15), (2, 0, 18, 0, 17, 0, 15),
(0, 0, 18, 0, 17, 0, 16), (1, 0, 19, 0, 17, 0, 16), (2, 0, 19, 0, 18, 0, 16), (0, 0,
19, 0, 18, 0, 17), (1, 1, 19, 0, 18, 0, 17), (2, 1, 19, 0, 19, 0, 17), (0, 1, 19, 0,
19, 0, 18), (1, 2, 19, 0, 19, 0, 18), (2, 2, 19, 1, 19, 0, 18), (0, 2, 19, 1, 19, 0,
19), (1, 2, 18, 1, 19, 0, 19), (2, 2, 18, 2, 19, 0, 19), (0, 2, 18, 2, 19, 1, 19), (1
, 2, 18, 2, 19, 1, 19), (2, 2, 18, 3, 19, 1, 19), (0, 2, 18, 3, 19, 2, 19), (1, 2, 18
, 3, 19, 2, 19), (2, 2, 18, 4, 19, 2, 19), (0, 2, 18, 4, 19, 3, 19), (1, 2, 19, 4, 19
, 3, 19), (2, 2, 19, 4, 19, 3, 19), (0, 2, 19, 4, 19, 3, 19), (1, 1, 19, 4, 19, 3, 19
), (2, 1, 19, 4, 19, 3, 19), (0, 1, 19, 4, 19, 2, 19), (1, 1, 19, 4, 19, 2, 19), (2,
1, 19, 4, 19, 2, 19), (0, 1, 19, 4, 19, 2, 18), (1, 0, 19, 4, 19, 2, 18), (2, 0, 19,
4, 19, 2, 18), (0, 0, 19, 4, 19, 2, 18), (1, 0, 18, 4, 19, 2, 18), (2, 0, 18, 4, 19,
2, 18), (0, 0, 18, 4, 19, 2, 18), (1, 0, 17, 4, 19, 2, 18), (2, 0, 17, 4, 19, 2, 18),
(0, 0, 17, 4, 19, 2, 18), (1, 0, 16, 4, 19, 2, 18), (2, 0, 16, 3, 19, 2, 18), (0, 0,
16, 3, 19, 2, 18), (1, 0, 16, 3, 19, 2, 18), (2, 0, 16, 2, 19, 2, 18), (0, 0, 16, 2,
19, 2, 18), (1, 0, 15, 2, 19, 2, 18), (2, 0, 15, 1, 19, 2, 18), (0, 0, 15, 1, 19, 2,
18), (1, 0, 15, 1, 19, 2, 18), (2, 0, 15, 0, 19, 2, 18), (0, 0, 15, 0, 19, 2, 18), (
1, 0, 14, 0, 19, 2, 18), (2, 0, 14, 0, 18, 2, 18), (0, 0, 14, 0, 18, 2, 18), (1, 0, 1
3, 0, 18, 2, 18), (2, 0, 13, 0, 17, 2, 18), (0, 0, 13, 0, 17, 2, 18), (1, 0, 12, 0, 1
7, 2, 18), (2, 0, 12, 0, 17, 2, 18), (0, 0, 12, 0, 17, 2, 18), (1, 0, 11, 0, 17, 2, 1
8), (2, 0, 11, 0, 16, 2, 18), (0, 0, 11, 0, 16, 2, 18), (1, 0, 11, 0, 16, 2, 18), (2,
0, 11, 0, 15, 2, 18), (0, 0, 11, 0, 15, 2, 18), (1, 0, 10, 0, 15, 2, 18), (2, 0, 10,
0, 14, 2, 18), (0, 0, 10, 0, 14, 2, 18), (1, 0, 9, 0, 14, 2, 18), (2, 0, 9, 0, 13, 2
, 18), (0, 0, 9, 0, 13, 2, 18), (1, 0, 8, 0, 13, 2, 18), (2, 0, 8, 0, 12, 2, 18), (0,
0, 8, 0, 12, 2, 18), (1, 0, 7, 0, 12, 2, 18), (2, 0, 7, 0, 11, 2, 18), (0, 0, 7, 0,
11, 2, 18), (1, 0, 7, 0, 11, 2, 18), (2, 0, 7, 0, 10, 2, 18), (0, 0, 7, 0, 10, 2, 18)
, (1, 0, 7, 0, 10, 2, 18), (2, 0, 7, 0, 9, 2, 18), (0, 0, 7, 0, 9, 2, 18), (1, 0, 7,
0, 9, 2, 18), (2, 0, 7, 0, 8, 2, 18), (0, 0, 7, 0, 8, 2, 19), (1, 0, 7, 0, 8, 2, 19),
(2, 0, 7, 0, 8, 2, 19), (0, 0, 7, 0, 8, 1, 19), (1, 0, 6, 0, 8, 1, 19), (2, 0, 6, 0,
8, 1, 19), (0, 0, 6, 0, 8, 0, 19), (1, 0, 6, 0, 8, 0, 19), (2, 0, 6, 0, 7, 0, 19), (
0, 0, 6, 0, 7, 0, 18), (1, 0, 6, 0, 7, 0, 18), (2, 0, 6, 0, 7, 0, 18), (0, 0, 6, 0, 7
, 0, 17), (1, 0, 5, 0, 7, 0, 17), (2, 0, 5, 0, 7, 0, 17), (0, 0, 5, 0, 7, 0, 16), (1,
0, 5, 0, 7, 0, 16), (2, 0, 5, 0, 6, 0, 16), (0, 0, 5, 0, 6, 0, 15), (1, 0, 4, 0, 6,
0, 15), (2, 0, 4, 0, 6, 0, 15), (0, 0, 4, 0, 6, 0, 14), (1, 0, 4, 0, 6, 0, 14), (2, 0
, 4, 0, 6, 0, 14), (0, 0, 4, 0, 6, 0, 13), (1, 0, 3, 0, 6, 0, 13), (2, 0, 3, 0, 6, 0,
13), (0, 0, 3, 0, 6, 0, 12), (1, 0, 3, 0, 6, 0, 12), (2, 0, 3, 0, 5, 0, 12), (0, 0,
3, 0, 5, 0, 11), (1, 0, 3, 0, 5, 0, 11), (2, 0, 3, 0, 4, 0, 11), (0, 0, 3, 0, 4, 0, 1
0), (1, 0, 2, 0, 4, 0, 10), (2, 0, 2, 0, 3, 0, 10), (0, 0, 2, 0, 3, 0, 9), (1, 0, 1,
0, 3, 0, 9), (2, 0, 1, 0, 2, 0, 9), (0, 0, 1, 0, 2, 0, 8), (1, 0, 0, 0, 2, 0, 8), (2,
0, 0, 0, 1, 0, 8), (0, 0, 0, 0, 1, 0, 7), (1, 0, 0, 0, 1, 0, 7), (2, 0, 0, 0, 1, 0,
```

```
7), (0, 0, 0, 0, 1, 0, 6), (1, 0, 0, 0, 1, 0, 6), (2, 0, 0, 0, 1, 0, 6), (0, 0, 0, 0, 1, 0, 5), (1, 0, 0, 0, 1, 0, 5), (2, 0, 0, 0, 1, 0, 5), (0, 0, 0, 0, 1, 0, 4), (1, 0, 0, 0, 1, 0, 4), (2, 0, 0, 0, 1, 0, 4), (0, 0, 0, 0, 1, 0, 3), (1, 0, 0, 0, 1, 0, 3), (2, 0, 0, 0, 1, 0, 3), (0, 0, 0, 0, 1, 0, 2)]
```

## Blind Robot

### Maze 1

Blind robot problem:

attempted with search method BFS

number of nodes visited: 9709

solution length: 11

cost: 10

```
path: [{(0, 1, 1), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 2, 2), (0, 0, 4), (0, 3, 2), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 4, 0), (0, 1, 0)}, ((0, 3, 3), (0, 3, 4), (0, 0, 2), (0, 1, 2), (0, 3, 0), (0, 0, 1), (0, 2, 2), (0, 3, 1), (0, 0, 0), (0, 0, 4), (0, 3, 2), (0, 0, 3)), ((0, 3, 3), (0, 3, 4), (0, 0, 2), (0, 0, 1), (0, 3, 1), (0, 1, 3), (0, 2, 2), (0, 0, 4), (0, 3, 2), (0, 0, 3)), ((0, 3, 3), (0, 3, 4), (0, 0, 2), (0, 2, 2), (0, 1, 4), (0, 0, 4), (0, 3, 2), (0, 0, 3)), ((0, 3, 3), (0, 3, 4), (0, 2, 2), (0, 1, 4), (0, 0, 4), (0, 0, 3)), ((0, 0, 4), (0, 3, 4), (0, 1, 4), (0, 2, 2)), ((0, 3, 3), (0, 2, 2), (0, 0, 3), (0, 1, 3)), ((0, 1, 2), (0, 3, 2), (0, 0, 2), (0, 2, 2)), ((0, 1, 2), (0, 0, 2), (0, 2, 2)), ((0, 1, 2), (0, 0, 2)), ((0, 0, 2),),)]
```

Blind robot problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 10245

solution length: 11

cost: 10

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

Blind robot problem:

attempted with search method Astar with heuristic state\_len\_heuristic

number of nodes visited: 1599

solution length: 17

cost: 16

path: [(0, 1, 1), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 2, 2), (0, 0, 4), (0, 3, 2), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 4, 0), (0, 1, 0)], ((0, 1, 1), (0, 4, 2), (0, 1, 0), (0, 1, 2), (0, 4, 1), (0, 4, 4), (0, 1, 3), (0, 2, 2), (0, 4, 0), (0, 1, 4), (0, 3, 2), (0, 4, 3)), ((0, 1, 1), (0, 4, 2), (0, 4, 1), (0, 1, 2), (0, 4, 0), (0, 2, 2), (0, 1, 3), (0, 3, 1), (0, 1, 0), (0, 4, 3)), ((0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 1, 2), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 3, 2), (0, 0, 3)), ((0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 0, 1), (0, 3, 1), (0, 2, 2), (0, 0, 0), (0, 0, 3)), ((0, 0, 2), (0, 3, 0), (0, 0, 1), (0, 2, 2), (0, 0, 0), (0, 3, 2)), ((0, 1, 1), (0, 4, 2), (0, 1, 0), (0, 1, 2), (0, 4, 0), (0, 3, 2)), ((0, 4, 2), (0, 1, 1), (0, 4, 0), (0, 2, 2), (0, 1, 0)), ((0, 4, 2), (0, 1, 1), (0, 1, 0), (0, 4, 0), (0, 3, 2)), ((0, 1, 1), (0, 3, 3), (0, 1, 2), (0, 4, 1), (0, 4, 3)), ((0, 4, 1), (0, 1, 1), (0, 4, 3), (0, 2, 2)), ((0, 1, 2), (0, 4, 2), (0, 4, 4), (0, 2, 2)), ((0, 4, 2), (0, 3, 2), (0, 4, 4), (0, 2, 2)), ((0, 4, 2), (0, 3, 2), (0, 4, 4)), ((0, 3, 3), (0, 4, 3), (0, 4, 4)), ((0, 3, 3), (0, 3, 4)), ((0, 3, 4),)]

Blind robot problem:

attempted with search method Astar with heuristic opt\_state\_len\_heuristic

number of nodes visited: 8769

solution length: 11

cost: 10

path: [(0, 1, 1), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 2, 2), (0, 0, 4), (0, 3, 2), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 4, 0), (0, 1, 0)], ((0, 3, 2), (0, 1, 1), (0, 4, 2), (0, 3, 3), (0, 0, 2), (0, 1, 2), (0, 3, 0), (0, 4, 1), (0, 0, 1), (0, 1, 3), (0, 2, 2), (0, 3, 1), (0, 4, 0), (0, 0, 0), (0, 1, 0), (0, 4, 3), (0, 0, 3)), ((0, 3, 2), (0, 1, 1), (0, 4, 2), (0, 0, 2), (0, 4, 1), (0, 3, 0), (0, 1, 2), (0, 0, 1), (0, 3, 1), (0, 4, 0), (0, 2, 2), (0, 0, 0), (0, 1, 0)), ((0, 4, 2), (0, 1, 1), (0, 1, 0), (0, 1, 2), (0, 4, 1), (0, 4, 0), (0, 2, 2), (0, 3, 2)), ((0, 1, 1), (0, 4, 1), (0, 2, 2), (0, 4, 0), (0, 3, 1), (0, 1, 0)), ((0, 3, 0), (0, 1, 0), (0, 2, 2), (0, 4, 0)), ((0, 4, 1), (0, 1, 1), (0, 2, 2), (0, 3, 1)), ((0, 1, 2), (0, 4, 2), (0, 3, 2), (0, 2, 2)), ((0, 4, 2), (0, 3, 2), (0, 2, 2)), ((0, 4, 2), (0, 3, 2)), ((0, 4, 2),)]

Blind robot problem:

attempted with search method Astar with heuristic uniq\_x\_y\_heuristic

number of nodes visited: 3256

solution length: 11

cost: 10

path: [(0, 1, 1), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 2, 2), (0, 0, 4), (0, 3, 2), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 4, 0), (0, 1, 0)], ((0, 3, 3), (0,

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4, 2), (0, 1, 1), (0, 3, 4), (0, 0, 2), (0, 1, 2), (0, 4, 1), (0, 4, 4), (0, 0, 1),
(0, 2, 2), (0, 1, 3), (0, 3, 1), (0, 1, 4), (0, 0, 4), (0, 3, 2), (0, 4, 3), (0, 0, 3
)), ((0, 3, 2), (0, 4, 2), (0, 1, 1), (0, 1, 2), (0, 4, 1), (0, 4, 4), (0, 2, 2), (0,
1, 3), (0, 1, 4), (0, 4, 3)), ((0, 3, 3), (0, 4, 2), (0, 1, 2), (0, 4, 4), (0, 1, 3)
, (0, 2, 2), (0, 1, 4), (0, 4, 3)), ((0, 3, 4), (0, 4, 4), (0, 1, 3), (0, 2, 2), (0,
1, 4), (0, 4, 3)), ((0, 4, 4), (0, 3, 4), (0, 1, 4), (0, 2, 2)), ((0, 3, 3), (0, 4, 3
), (0, 2, 2), (0, 1, 3)), ((0, 1, 2), (0, 4, 2), (0, 3, 2), (0, 2, 2)), ((0, 4, 2), (
0, 3, 2), (0, 2, 2)), ((0, 4, 2), (0, 3, 2)), ((0, 4, 2),)]
```

## Maze 2

Blind robot problem:

attempted with search method BFS

number of nodes visited: 19477

solution length: 13

cost: 12

```
path: [{(0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3),
(0, 1, 4), (0, 5, 0), (0, 2, 1), (0, 6, 5), (0, 1, 5), (0, 5, 1), (0, 2, 0), (0, 6, 4
), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 6
, 6), (0, 2, 5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 6, 0), (0
, 3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0), (0, 2, 6), (0, 0, 1), (0, 6, 2), (0, 3, 1),
(0, 0, 0), (0, 3, 6), (0, 4, 3), (0, 5, 4), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3,
5), (0, 4, 0), (0, 1, 0), (0, 4, 6)}, ((0, 5, 5), (0, 1, 1), (0, 4, 5), (0, 1, 2), (0
, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 6, 5), (0, 2, 1), (0, 5, 1), (0, 1, 5),
(0, 6, 4), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 6,
6), (0, 0, 5), (0, 2, 5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0,
3, 3), (0, 6, 3), (0, 0, 2), (0, 2, 6), (0, 6, 2), (0, 0, 1), (0, 3, 1), (0, 3, 6), (
0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 5, 4), (0, 4, 6)), ((0, 5,
5), (0, 1, 1), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0,
2, 1), (0, 6, 5), (0, 1, 5), (0, 5, 1), (0, 6, 4), (0, 1, 6), (0, 5, 2), (0, 2, 3), (
0, 5, 3), (0, 6, 6), (0, 2, 2), (0, 6, 1), (0, 2, 5), (0, 3, 2), (0, 2, 4), (0, 3, 3)
, (0, 6, 3), (0, 2, 6), (0, 6, 2), (0, 3, 1), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 3,
4), (0, 4, 1), (0, 3, 5), (0, 5, 4), (0, 4, 6)), ((0, 5, 5), (0, 4, 5), (0, 5, 6), (
0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 6, 5), (0, 1, 5), (0, 6, 4), (0, 1, 6)
, (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 6, 6), (0, 2, 5), (0, 3, 2), (0, 2,
4), (0, 3, 3), (0, 6, 3), (0, 6, 2), (0, 2, 6), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0,
3, 4), (0, 3, 5), (0, 5, 4), (0, 4, 6)), ((0, 5, 5), (0, 4, 5), (0, 5, 6), (0, 4, 4)
, (0, 6, 5), (0, 6, 4), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 6, 6), (0, 2,
5), (0, 3, 2), (0, 2, 4), (0, 3, 3), (0, 6, 3), (0, 2, 6), (0, 6, 2), (0, 3, 6), (0,
4, 3), (0, 4, 2), (0, 3, 4), (0, 3, 5), (0, 5, 4), (0, 4, 6)), ((0, 3, 2), (0, 5, 5)
, (0, 6, 4), (0, 3, 3), (0, 6, 3), (0, 4, 2), (0, 5, 4), (0, 3, 4), (0, 5, 2), (0, 4,
5), (0, 5, 6), (0, 6, 2), (0, 3, 5), (0, 5, 3), (0, 4, 4), (0, 6, 6), (0, 4, 6), (0,
3, 6), (0, 6, 5), (0, 4, 3)), ((0, 4, 2), (0, 6, 4), (0, 5, 5), (0, 6, 3), (0, 5, 2)
, (0, 4, 5), (0, 5, 4), (0, 5, 6), (0, 4, 4), (0, 6, 2), (0, 5, 3), (0, 6, 6), (0, 4,
6), (0, 6, 5), (0, 4, 3)), ((0, 6, 4), (0, 5, 5), (0, 6, 3), (0, 5, 2), (0, 5, 4), (
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0, 5, 6), (0, 6, 2), (0, 5, 3), (0, 6, 6), (0, 6, 5)), ((0, 6, 4), (0, 6, 3), (0, 6, 2), (0, 6, 6), (0, 6, 5)), ((0, 6, 4), (0, 6, 5), (0, 6, 3), (0, 6, 6)), ((0, 6, 4), (0, 6, 5), (0, 6, 6)), ((0, 6, 5), (0, 6, 6)), ((0, 6, 6),))]
```

Blind robot problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 19205

solution length: 13

cost: 12

```
path: [(0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 5, 0), (0, 2, 1), (0, 6, 5), (0, 1, 5), (0, 5, 1), (0, 2, 0), (0, 6, 4), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 6, 6), (0, 2, 5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 6, 0), (0, 3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0), (0, 2, 6), (0, 0, 1), (0, 6, 2), (0, 3, 1), (0, 0, 0), (0, 3, 6), (0, 4, 3), (0, 5, 4), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 1, 0), (0, 4, 6)), ((0, 5, 5), (0, 1, 1), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 5, 0), (0, 6, 5), (0, 2, 1), (0, 1, 5), (0, 5, 1), (0, 6, 4), (0, 2, 0), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 6, 6), (0, 2, 2), (0, 2, 5), (0, 6, 1), (0, 3, 2), (0, 6, 0), (0, 2, 4), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 2, 6), (0, 6, 2), (0, 3, 1), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 0, 3, 4), (0, 1, 0), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4), (0, 4, 6)), ((0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 5, 0), (0, 1, 4), (0, 6, 5), (0, 2, 1), (0, 5, 1), (0, 1, 5), (0, 6, 4), (0, 2, 0), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 2, 5), (0, 6, 1), (0, 3, 2), (0, 6, 0), (0, 2, 4), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 6, 2), (0, 3, 1), (0, 5, 4), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 1, 0)), ((0, 5, 5), (0, 4, 5), (0, 4, 4), (0, 5, 0), (0, 6, 5), (0, 2, 1), (0, 5, 1), (0, 6, 4), (0, 2, 0), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 6, 1), (0, 2, 5), (0, 3, 2), (0, 2, 4), (0, 6, 0), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 6, 2), (0, 3, 1), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4)), ((0, 4, 4), (0, 5, 0), (0, 2, 1), (0, 5, 1), (0, 6, 4), (0, 2, 0), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 6, 1), (0, 2, 5), (0, 3, 2), (0, 2, 4), (0, 6, 0), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 6, 2), (0, 3, 1), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 4, 0), (0, 5, 4)), ((0, 3, 2), (0, 6, 4), (0, 3, 3), (0, 4, 2), (0, 6, 3), (0, 3, 4), (0, 4, 3), (0, 5, 2), (0, 3, 0), (0, 4, 1), (0, 6, 2), (0, 5, 3), (0, 4, 4), (0, 3, 1), (0, 4, 0), (0, 5, 1), (0, 6, 1), (0, 5, 0), (0, 5, 4), (0, 6, 0)), ((0, 3, 3), (0, 4, 2), (0, 6, 3), (0, 5, 2), (0, 4, 3), (0, 4, 1), (0, 3, 0), (0, 6, 2), (0, 5, 3), (0, 3, 1), (0, 4, 0), (0, 6, 0), (0, 6, 1), (0, 5, 0), (0, 3, 2), (0, 5, 1)), ((0, 4, 2), (0, 6, 3), (0, 5, 2), (0, 4, 1), (0, 5, 3), (0, 6, 2), (0, 4, 0), (0, 6, 0), (0, 5, 0), (0, 6, 1), (0, 4, 3), (0, 5, 1)), ((0, 4, 2), (0, 5, 2), (0, 4, 1), (0, 6, 2), (0, 4, 0), (0, 6, 0), (0, 6, 1), (0, 5, 0), (0, 5, 1)), ((0, 4, 1), (0, 4, 0), (0, 5, 1), (0, 6, 1), (0, 5, 0), (0, 6, 0)), ((0, 6, 1), (0, 5, 1), (0, 5, 0), (0, 6, 0)), ((0, 6, 0), (0, 6, 1)), ((0, 6, 0),)]]
```

Blind robot problem:

attempted with search method Astar with heuristic state\_len\_heuristic



number of nodes visited: 205

solution length: 17

cost: 16

path: [(0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 5, 0), (0, 2, 1), (0, 6, 5), (0, 1, 5), (0, 5, 1), (0, 2, 0), (0, 6, 4), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 6, 6), (0, 2, 5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 6, 0), (0, 3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0), (0, 2, 6), (0, 0, 1), (0, 6, 2), (0, 3, 1), (0, 0, 0), (0, 3, 6), (0, 4, 3), (0, 5, 4), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 1, 0), (0, 4, 6)], ((0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 5, 0), (0, 2, 1), (0, 1, 5), (0, 5, 1), (0, 2, 0), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 2, 5), (0, 0, 4), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 3, 0), (0, 2, 6), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 0, 3, 4), (0, 1, 0), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4), (0, 4, 6)], ((0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 2, 1), (0, 5, 1), (0, 1, 5), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 2, 5), (0, 0, 4), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 2, 6), (0, 0, 1), (0, 3, 1), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 5, 4), (0, 4, 6)], ((0, 1, 1), (0, 4, 5), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 2, 1), (0, 1, 5), (0, 1, 6), (0, 2, 3), (0, 0, 6), (0, 2, 2), (0, 0, 5), (0, 2, 5), (0, 0, 4), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 3, 3), (0, 0, 2), (0, 2, 6), (0, 0, 1), (0, 3, 1), (0, 3, 6), (0, 3, 4), (0, 3, 5)), ((0, 1, 1), (0, 1, 6), (0, 0, 2), (0, 1, 2), (0, 0, 6), (0, 2, 3), (0, 2, 6), (0, 0, 1), (0, 1, 3), (0, 0, 5), (0, 2, 2), (0, 1, 4), (0, 0, 4), (0, 2, 5), (0, 2, 1), (0, 2, 4), (0, 1, 5), (0, 0, 3)), ((0, 1, 5), (0, 1, 6), (0, 0, 2), (0, 1, 2), (0, 0, 6), (0, 2, 3), (0, 2, 6), (0, 1, 3), (0, 0, 5), (0, 2, 2), (0, 0, 4), (0, 1, 4), (0, 2, 5), (0, 2, 4), (0, 0, 3)), ((0, 3, 3), (0, 1, 6), (0, 3, 4), (0, 2, 3), (0, 2, 6), (0, 3, 5), (0, 1, 3), (0, 3, 6), (0, 2, 5), (0, 1, 4), (0, 2, 4), (0, 1, 5)), ((0, 1, 6), (0, 3, 4), (0, 2, 6), (0, 3, 5), (0, 3, 6), (0, 1, 4), (0, 2, 5), (0, 2, 4), (0, 1, 5)), ((0, 3, 3), (0, 3, 4), (0, 2, 3), (0, 3, 5), (0, 1, 3), (0, 2, 5), (0, 1, 4), (0, 2, 4), (0, 1, 5)), ((0, 1, 5), (0, 2, 3), (0, 1, 3), (0, 0, 5), (0, 2, 5), (0, 0, 4), (0, 1, 4), (0, 2, 4), (0, 0, 3)), ((0, 1, 3), (0, 0, 5), (0, 1, 4), (0, 0, 4), (0, 1, 5), (0, 0, 3)), ((0, 1, 6), (0, 0, 6), (0, 0, 5), (0, 1, 4), (0, 0, 4), (0, 1, 5)), ((0, 0, 5), (0, 0, 6), (0, 1, 6), (0, 1, 5)), ((0, 0, 6), (0, 1, 6)), ((0, 0, 6))]

Blind robot problem:

attempted with search method Astar with heuristic opt\_state\_len\_heuristic

number of nodes visited: 13081

solution length: 13

cost: 12

```
path: [(0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3),
(0, 1, 4), (0, 5, 0), (0, 2, 1), (0, 6, 5), (0, 1, 5), (0, 5, 1), (0, 2, 0), (0, 6, 4),
(0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 6,
6), (0, 2, 5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 6, 0), (0,
3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0), (0, 2, 6), (0, 0, 1), (0, 6, 2), (0, 3, 1),
(0, 0, 0), (0, 3, 6), (0, 4, 3), (0, 5, 4), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3,
5), (0, 4, 0), (0, 1, 0), (0, 4, 6)), ((0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0,
4, 4), (0, 1, 3), (0, 5, 0), (0, 1, 4), (0, 2, 1), (0, 6, 5), (0, 5, 1), (0, 1, 5),
(0, 2, 0), (0, 6, 4), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 2,
5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 6, 0), (0, 3, 3), (0,
6, 3), (0, 0, 2), (0, 3, 0), (0, 6, 2), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0,
4, 2), (0, 3, 4), (0, 1, 0), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4)), ((0, 1,
1), (0, 1, 2), (0, 4, 4), (0, 1, 3), (0, 5, 0), (0, 1, 4), (0, 2, 1), (0, 5, 1), (0,
2, 0), (0, 6, 4), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 6, 1), (0, 0, 4), (0,
3, 2), (0, 6, 0), (0, 2, 4), (0, 0, 3), (0, 3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0),
(0, 6, 2), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 1,
0), (0, 4, 1), (0, 4, 0), (0, 5, 4)), ((0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 5, 0), (0,
2, 1), (0, 5, 1), (0, 2, 0), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 2, 2), (0, 6, 1),
(0, 3, 2), (0, 6, 0), (0, 0, 3), (0, 3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0), (0, 6,
2), (0, 0, 1), (0, 3, 1), (0, 0, 0), (0, 4, 3), (0, 4, 2), (0, 4, 1), (0, 4, 0), (0,
1, 0)), ((0, 1, 1), (0, 1, 2), (0, 5, 0), (0, 2, 1), (0, 5, 1), (0, 2, 0), (0, 5, 2),
(0, 2, 2), (0, 6, 1), (0, 3, 2), (0, 6, 0), (0, 0, 2), (0, 3, 0), (0, 6, 2), (0, 0,
1), (0, 3, 1), (0, 0, 0), (0, 4, 2), (0, 4, 1), (0, 4, 0), (0, 1, 0)), ((0, 1, 1), (0,
2, 0), (0, 2, 1), (0, 3, 0), (0, 4, 1), (0, 0, 1), (0, 6, 0), (0, 3, 1), (0, 4, 0),
(0, 0, 0), (0, 5, 0), (0, 6, 1), (0, 1, 0), (0, 5, 1)), ((0, 2, 0), (0, 3, 0), (0,
4, 0), (0, 0, 0), (0, 5, 0), (0, 1, 0), (0, 6, 0)), ((0, 2, 0), (0, 3, 0), (0, 4, 0),
(0, 0, 0), (0, 1, 0)), ((0, 3, 0), (0, 2, 0), (0, 1, 0), (0, 0, 0)), ((0, 2, 0), (0, 1, 0), (0, 0, 0)), ((0, 1, 0), (0, 0, 0)), ((0, 0, 0))]
```

Blind robot problem:

attempted with search method Astar with heuristic uniq\_x\_y\_heuristic

number of nodes visited: 513

solution length: 14

cost: 13

```
path: [(0, 1, 1), (0, 5, 5), (0, 4, 5), (0, 1, 2), (0, 5, 6), (0, 4, 4), (0, 1, 3),
(0, 1, 4), (0, 5, 0), (0, 2, 1), (0, 6, 5), (0, 1, 5), (0, 5, 1), (0, 2, 0), (0, 6, 4),
(0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 0, 6), (0, 5, 3), (0, 2, 2), (0, 0, 5), (0, 6,
6), (0, 2, 5), (0, 0, 4), (0, 6, 1), (0, 3, 2), (0, 2, 4), (0, 0, 3), (0, 6, 0), (0,
3, 3), (0, 6, 3), (0, 0, 2), (0, 3, 0), (0, 2, 6), (0, 0, 1), (0, 6, 2), (0, 3, 1),
(0, 0, 0), (0, 3, 6), (0, 4, 3), (0, 5, 4), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3,
5), (0, 4, 0), (0, 1, 0), (0, 4, 6)), ((0, 5, 5), (0, 1, 1), (0, 4, 5), (0, 1, 2), (0,
5, 6), (0, 4, 4), (0, 1, 3), (0, 1, 4), (0, 5, 0), (0, 6, 5), (0, 2, 1), (0, 1, 5),
```

```
(0, 5, 1), (0, 6, 4), (0, 2, 0), (0, 1, 6), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 6, 6), (0, 2, 2), (0, 2, 5), (0, 6, 1), (0, 3, 2), (0, 6, 0), (0, 2, 4), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 2, 6), (0, 6, 2), (0, 3, 1), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 1, 0), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4), (0, 4, 6)), ((0, 5, 5), (0, 4, 5), (0, 5, 6), (0, 4, 4), (0, 5, 0), (0, 2, 1), (0, 6, 5), (0, 5, 1), (0, 6, 4), (0, 2, 0), (0, 5, 2), (0, 2, 3), (0, 5, 3), (0, 6, 6), (0, 2, 2), (0, 2, 5), (0, 6, 1), (0, 3, 2), (0, 6, 0), (0, 2, 4), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 2, 6), (0, 6, 2), (0, 3, 1), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4), (0, 4, 6)), ((0, 5, 5), (0, 4, 5), (0, 5, 6), (0, 4, 4), (0, 5, 0), (0, 6, 5), (0, 5, 1), (0, 6, 4), (0, 5, 2), (0, 5, 3), (0, 6, 6), (0, 6, 1), (0, 3, 2), (0, 6, 0), (0, 3, 3), (0, 6, 3), (0, 3, 0), (0, 6, 2), (0, 3, 1), (0, 3, 6), (0, 4, 3), (0, 4, 2), (0, 3, 4), (0, 4, 1), (0, 3, 5), (0, 4, 0), (0, 5, 4), (0, 4, 6)), ((0, 5, 5), (0, 4, 5), (0, 5, 6), (0, 4, 4), (0, 5, 0), (0, 6, 5), (0, 5, 1), (0, 6, 4), (0, 5, 2), (0, 5, 3), (0, 6, 6), (0, 6, 1), (0, 6, 0), (0, 6, 3), (0, 6, 2), (0, 4, 3), (0, 4, 2), (0, 4, 1), (0, 4, 0), (0, 5, 4), (0, 4, 6)), ((0, 6, 4), (0, 4, 2), (0, 5, 5), (0, 4, 5), (0, 5, 2), (0, 5, 4), (0, 6, 3), (0, 5, 6), (0, 4, 3), (0, 4, 1), (0, 5, 3), (0, 6, 2), (0, 4, 4), (0, 6, 6), (0, 4, 6), (0, 6, 1), (0, 6, 5), (0, 5, 1)), ((0, 6, 4), (0, 5, 5), (0, 5, 2), (0, 6, 3), (0, 5, 4), (0, 5, 6), (0, 6, 2), (0, 5, 3), (0, 6, 6), (0, 6, 1), (0, 6, 5), (0, 5, 1)), ((0, 6, 4), (0, 6, 3), (0, 6, 2), (0, 6, 6), (0, 6, 1), (0, 6, 5)), ((0, 6, 4), (0, 6, 3), (0, 6, 2), (0, 6, 1), (0, 6, 0)), ((0, 6, 4), (0, 6, 3), (0, 6, 2), (0, 6, 1), (0, 6, 0)), ((0, 6, 2), (0, 6, 3), (0, 6, 0), (0, 6, 1)), ((0, 6, 2), (0, 6, 0), (0, 6, 1)), ((0, 6, 0), (0, 6, 1)), ((0, 6, 0),))]
```

### Maze 3

Blind robot problem:

attempted with search method BFS

number of nodes visited: 4380

solution length: 9

cost: 8

```
path: [{(0, 3, 2), (0, 1, 1), (0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 2), (0, 1, 3), (0, 2, 2), (0, 3, 1), (0, 1, 4), (0, 2, 5), (0, 1, 0), (0, 2, 4)}, ((0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 0), (0, 3, 1), (0, 2, 2), (0, 1, 3), (0, 2, 5), (0, 3, 2), (0, 2, 4)), ((0, 1, 1), (0, 3, 3), (0, 3, 4), (0, 2, 2), (0, 1, 4), (0, 2, 5), (0, 3, 2)), ((0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 2, 5), (0, 3, 2), (0, 2, 4)), ((0, 3, 3), (0, 2, 1), (0, 3, 1), (0, 3, 2), (0, 2, 4)), ((0, 3, 3), (0, 3, 2), (0, 3, 4), (0, 3, 1)), ((0, 3, 3), (0, 3, 2), (0, 3, 1)), ((0, 3, 2), (0, 3, 1)), ((0, 3, 1),)]
```

Blind robot problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 4514

solution length: 9

cost: 8

```
path: [(0, 3, 2), (0, 1, 1), (0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 2), (0, 1, 3),
```

```
(0, 2, 2), (0, 3, 1), (0, 1, 4), (0, 2, 5), (0, 1, 0), (0, 2, 4)), ((0, 3, 3), (0, 1, 1), (0, 3, 4), (0, 1, 2), (0, 1, 3), (0, 2, 2), (0, 1, 4), (0, 2, 5), (0, 3, 2)), ((0, 3, 2), (0, 3, 3), (0, 3, 4), (0, 1, 3), (0, 2, 2), (0, 2, 5), (0, 2, 1), (0, 2, 4)), ((0, 3, 3), (0, 2, 1), (0, 1, 2), (0, 3, 1), (0, 3, 2), (0, 2, 4)), ((0, 3, 3), (0, 3, 4), (0, 2, 2), (0, 3, 1), (0, 3, 2)), ((0, 3, 3), (0, 3, 2), (0, 2, 1), (0, 3, 1)), ((0, 3, 2), (0, 2, 1), (0, 3, 1)), ((0, 2, 1), (0, 3, 1)), ((0, 3, 1),)]
```

Blind robot problem:

attempted with search method Astar with heuristic state\_len\_heuristic

number of nodes visited: 917

solution length: 11

cost: 10

```
path: (((0, 3, 2), (0, 1, 1), (0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 2), (0, 1, 3), (0, 2, 2), (0, 3, 1), (0, 1, 4), (0, 2, 5), (0, 1, 0), (0, 2, 4)), ((0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 0), (0, 3, 1), (0, 2, 2), (0, 1, 3), (0, 2, 5), (0, 3, 2), (0, 2, 4)), ((0, 3, 3), (0, 3, 4), (0, 1, 0), (0, 3, 1), (0, 1, 3), (0, 2, 5), (0, 3, 2)), ((0, 3, 3), (0, 2, 1), (0, 1, 3), (0, 2, 2), (0, 2, 5), (0, 1, 0), (0, 2, 4)), ((0, 1, 1), (0, 3, 4), (0, 2, 2), (0, 2, 5), (0, 1, 4)), ((0, 3, 4), (0, 1, 2), (0, 2, 2), (0, 1, 4), (0, 2, 5)), ((0, 1, 2), (0, 2, 5), (0, 2, 4), (0, 1, 4)), ((0, 1, 4), (0, 2, 5), (0, 1, 3)), ((0, 2, 5), (0, 1, 4)), ((0, 2, 4), (0, 2, 5)), ((0, 2, 5),))]
```

Blind robot problem:

attempted with search method Astar with heuristic opt\_state\_len\_heuristic

number of nodes visited: 4288

solution length: 9

cost: 8

```
path: (((0, 3, 2), (0, 1, 1), (0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 2), (0, 1, 3), (0, 2, 2), (0, 3, 1), (0, 1, 4), (0, 2, 5), (0, 1, 0), (0, 2, 4)), ((0, 1, 1), (0, 3, 3), (0, 1, 0), (0, 1, 2), (0, 2, 2), (0, 1, 3), (0, 1, 4), (0, 2, 5), (0, 2, 1), (0, 2, 4)), ((0, 1, 1), (0, 3, 4), (0, 1, 2), (0, 2, 2), (0, 1, 3), (0, 1, 4), (0, 2, 5)), ((0, 1, 1), (0, 1, 2), (0, 1, 3), (0, 1, 4), (0, 2, 5), (0, 2, 4)), ((0, 1, 2), (0, 2, 5), (0, 1, 4), (0, 1, 3)), ((0, 1, 4), (0, 2, 5), (0, 1, 3)), ((0, 2, 5), (0, 1, 4)), ((0, 2, 4), (0, 2, 5)), ((0, 2, 5),))]
```

Blind robot problem:

attempted with search method Astar with heuristic uniq\_x\_y\_heuristic

number of nodes visited: 345

solution length: 9

cost: 8

```
path: (((0, 3, 2), (0, 1, 1), (0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 1, 2), (0, 1, 3), (0, 2, 2), (0, 3, 1), (0, 1, 4), (0, 2, 5), (0, 1, 0), (0, 2, 4)), ((0, 3, 3), (0, 1, 1), (0, 2, 1), (0, 1, 0), (0, 1, 2), (0, 3, 1), (0, 1, 3), (0, 3, 2), (0, 2, 4)), ((0, 3, 2), (0, 3, 3), (0, 3, 4), (0, 1, 0), (0, 2, 2), (0, 3, 1), (0, 1, 3), (0, 2, 1)), ((0, 3, 3), (0, 1, 1), (0, 3, 4), (0, 2, 2), (0, 1, 4), (0, 3, 2)), ((0, 3, 3), (0, 2, 1), (0, 3, 4), (0, 3, 2), (0, 2, 4)), ((0, 3, 3), (0, 3, 2), (0, 3, 4), (0, 3, 1
```

```
)), ((0, 3, 3), (0, 3, 2), (0, 3, 4)), ((0, 3, 3), (0, 3, 4)), ((0, 3, 4),)]
```

## Cost based on time (bonus)

Mazeworld problem:

attempted with search method BFS

number of nodes visited: 74850

solution length: 23

cost: 22

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

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 74477

solution length: 23

cost: 22

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

## Tiebreaking (bonus)

Mazeworld problem:

attempted with search method Astar with heuristic null\_heuristic

number of nodes visited: 32179

solution length: 1975

cost: 1410

```
path: [(0, 0, 3, 0, 2, 0, 1), (1, 0, 3, 0, 2, 0, 1), (2, 0, 3, 1, 2, 0, 1), (0, 0, 3,
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Mazeworld problem:

attempted with search method Astar with heuristic manhattan\_heuristic

number of nodes visited: 18980

solution length: 2546

cost: 1846

path: [(0, 0, 3, 0, 2, 0, 1), (1, 1, 3, 0, 2, 0, 1), (2, 1, 3, 1, 2, 0, 1), (0, 1, 3,  
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