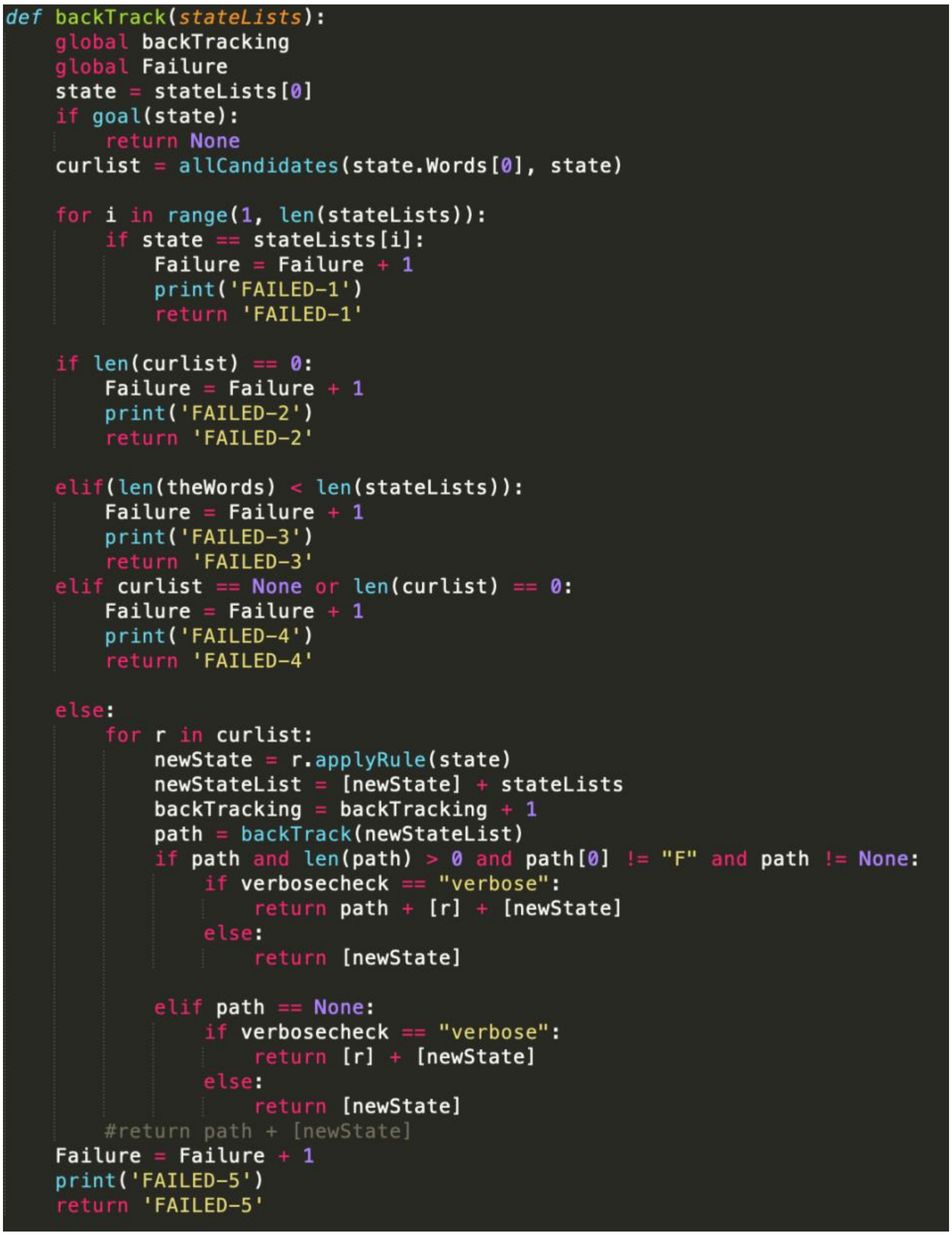
CS 380 Homework 2 – Uniformed Search

Yena Lee (Student ID : 14531969)

2. Programs to be turned in:

A. *Search: Backtracking - Word Search Creator (40 points)*



```python
def backTrack(stateLists):
    global backTracking
    global Failure
    state = stateLists[0]
    if goal(state):
        return None
    curlist = allCandidates(state.Words[0], state)

    for i in range(1, len(stateLists)):
        if state == stateLists[i]:
            Failure = Failure + 1
            print('FAILED-1')
            return 'FAILED-1'

    if len(curlist) == 0:
        Failure = Failure + 1
        print('FAILED-2')
        return 'FAILED-2'

    elif(len(theWords) < len(stateLists)):
        Failure = Failure + 1
        print('FAILED-3')
        return 'FAILED-3'
    elif curlist == None or len(curlist) == 0:
        Failure = Failure + 1
        print('FAILED-4')
        return 'FAILED-4'

    else:
        for r in curlist:
            newState = r.applyRule(state)
            newStateList = [newState] + stateLists
            backTracking = backTracking + 1
            path = backTrack(newStateList)
            if path and len(path) > 0 and path[0] != "F" and path != None:
                if verbosecheck == "verbose":
                    return path + [r] + [newState]
                else:
                    return [newState]

            elif path == None:
                if verbosecheck == "verbose":
                    return [r] + [newState]
                else:
                    return [newState]
        #return path + [newState]
    Failure = Failure + 1
    print('FAILED-5')
    return 'FAILED-5'
```

- Description –

I used backtracking algorithm to apply backtracking in Word Search Creator that I made for the last assignment. I used 5 Failed messages and 1 goal condition.

If state is a member of the rest of stateList, it returns ‘FAILED-1’, If it is deadEnd state, it returns ‘FAILED-2’. DeadEnd state is if there is a word that has yet to be placed in the grid, and allCandidates returns no candidates for that word.

If it is goal state, it returns NULL.

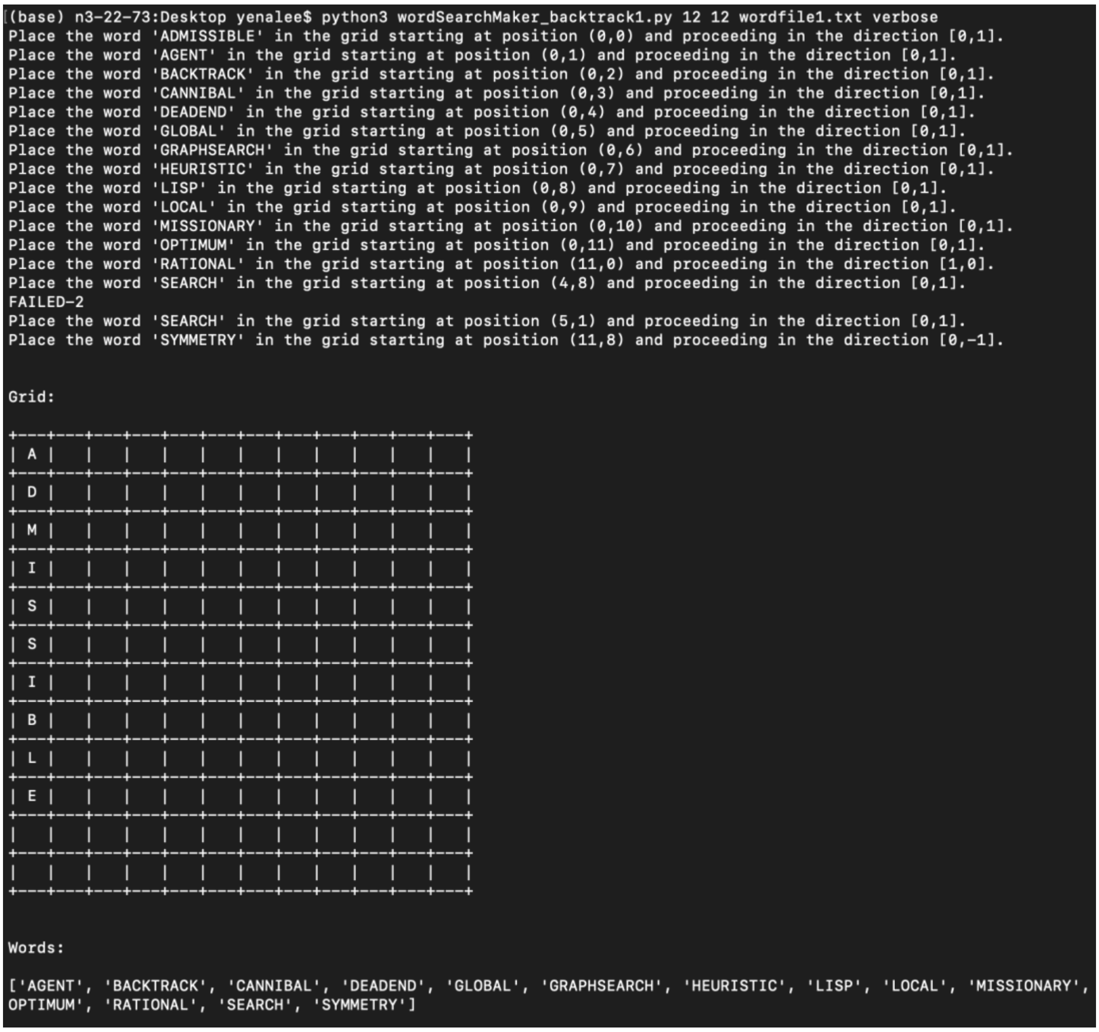
If length of stateList is longer than depthBound, it returns ‘Failed-3’.

And if ruleset is None, it returns ‘FAILED-4’.

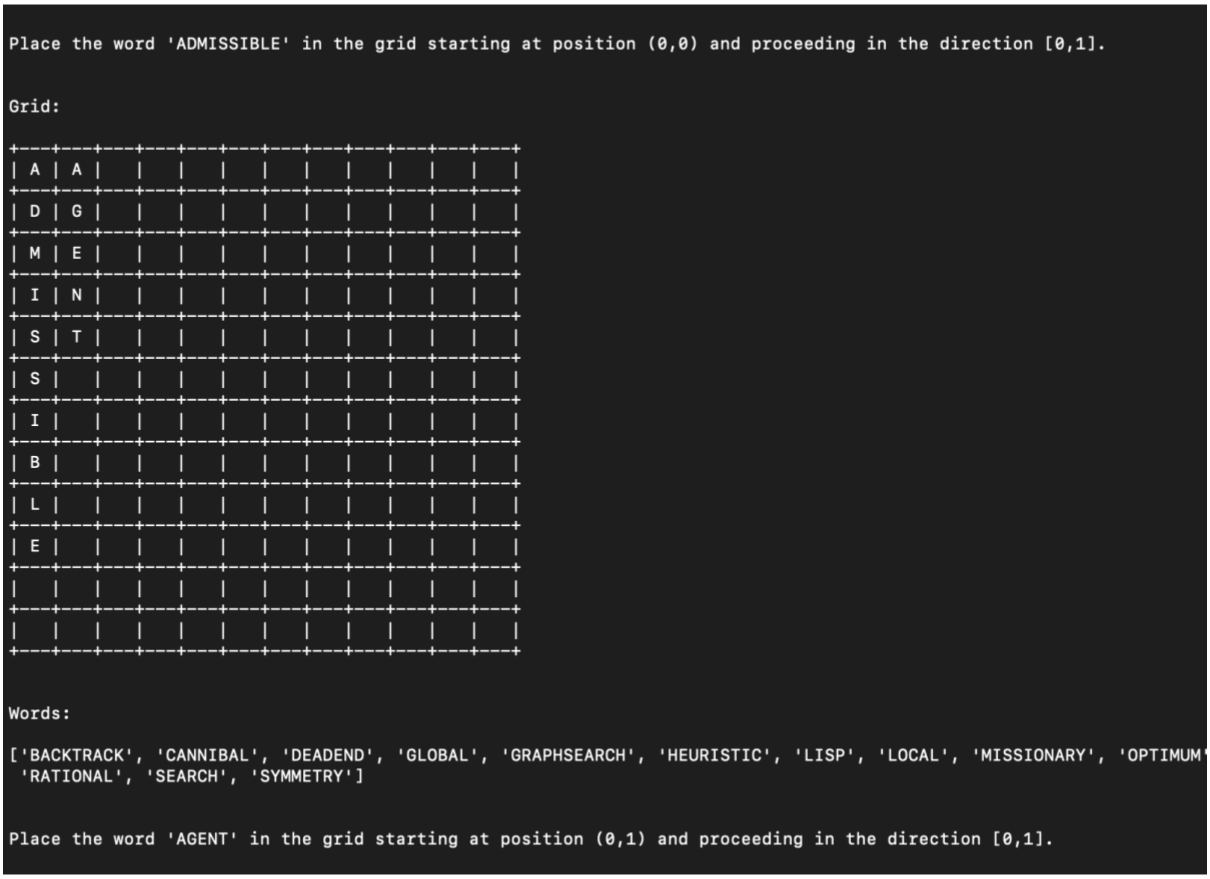
And if nothing occured, it returns ‘FAILED-5’.

Finally, this function “BackTracking” recurse again and again with the appropriate condition, so that it can print each rules and states at the end.

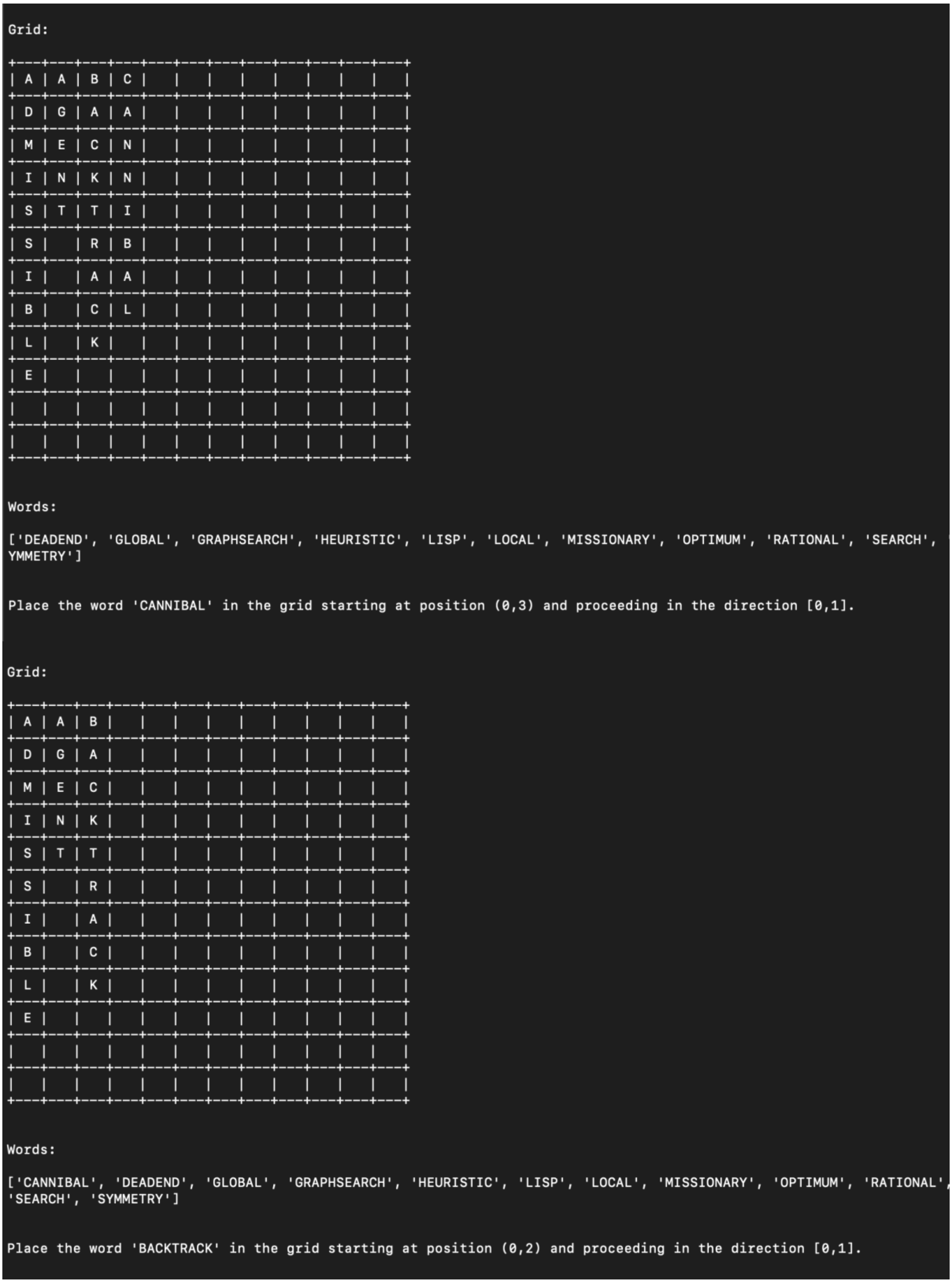
==========================Result============================



```
[(base) n3-22-73:Desktop yenalee$ python3 wordSearchMaker_backtrack1.py 12 12 wordfile1.txt verbose
Place the word 'ADMISSIBLE' in the grid starting at position (0,0) and proceeding in the direction [0,1].
Place the word 'AGENT' in the grid starting at position (0,1) and proceeding in the direction [0,1].
Place the word 'BACKTRACK' in the grid starting at position (0,2) and proceeding in the direction [0,1].
Place the word 'CANNIBAL' in the grid starting at position (0,3) and proceeding in the direction [0,1].
Place the word 'DEADEND' in the grid starting at position (0,4) and proceeding in the direction [0,1].
Place the word 'GLOBAL' in the grid starting at position (0,5) and proceeding in the direction [0,1].
Place the word 'GRAPHSEARCH' in the grid starting at position (0,6) and proceeding in the direction [0,1].
Place the word 'HEURISTIC' in the grid starting at position (0,7) and proceeding in the direction [0,1].
Place the word 'LISP' in the grid starting at position (0,8) and proceeding in the direction [0,1].
Place the word 'LOCAL' in the grid starting at position (0,9) and proceeding in the direction [0,1].
Place the word 'MISSIONARY' in the grid starting at position (0,10) and proceeding in the direction [0,1].
Place the word 'OPTIMUM' in the grid starting at position (0,11) and proceeding in the direction [0,1].
Place the word 'RATIONAL' in the grid starting at position (11,0) and proceeding in the direction [1,0].
Place the word 'SEARCH' in the grid starting at position (4,8) and proceeding in the direction [0,1].
FAILED-2
Place the word 'SEARCH' in the grid starting at position (5,1) and proceeding in the direction [0,1].
Place the word 'SYMMETRY' in the grid starting at position (11,8) and proceeding in the direction [0,-1].


Grid:

+---+---+---+---+---+---+---+---+---+---+---+---+
| A |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| D |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| M |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| B |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| L |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| E |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+


Words:

['AGENT', 'BACKTRACK', 'CANNIBAL', 'DEADEND', 'GLOBAL', 'GRAPHSEARCH', 'HEURISTIC', 'LISP', 'LOCAL', 'MISSIONARY',
OPTIMUM', 'RATIONAL', 'SEARCH', 'SYMMETRY']
```

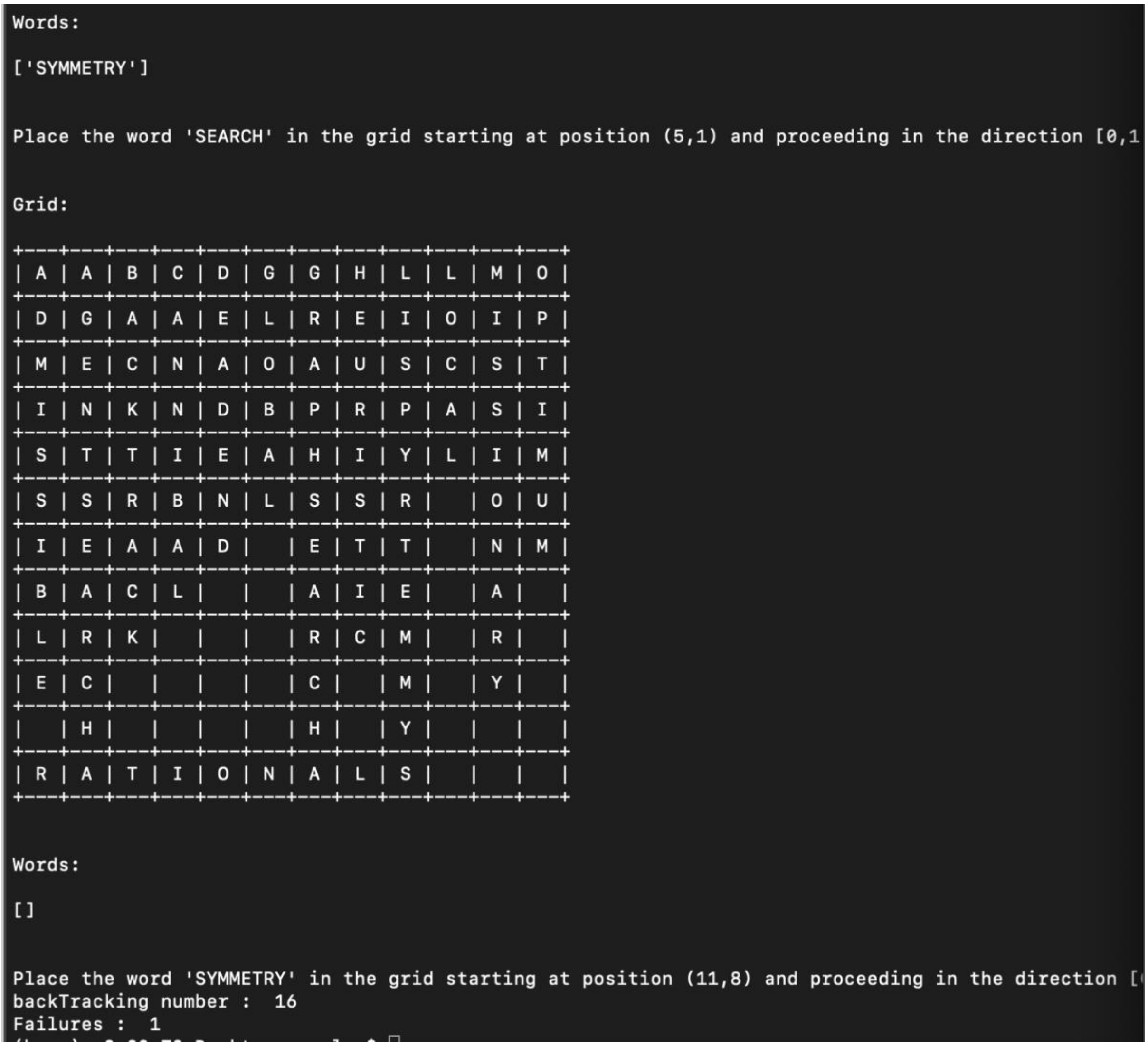


```
Place the word 'ADMISSIBLE' in the grid starting at position (0,0) and proceeding in the direction [0,1].


Grid:

+---+---+---+---+---+---+---+---+---+---+---+---+
| A | A |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| D | G |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| M | E |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I | N |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S | T |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| B |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| L |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| E |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+


Words:

['BACKTRACK', 'CANNIBAL', 'DEADEND', 'GLOBAL', 'GRAPHSEARCH', 'HEURISTIC', 'LISP', 'LOCAL', 'MISSIONARY', 'OPTIMUM'
 'RATIONAL', 'SEARCH', 'SYMMETRY']


Place the word 'AGENT' in the grid starting at position (0,1) and proceeding in the direction [0,1].
```



```
Grid:

+---+---+---+---+---+---+---+---+---+---+---+---+
| A | A | B | C |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| D | G | A | A |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| M | E | C | N |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I | N | K | N |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S | T | T | I |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S |   | R | B |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I |   | A | A |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| B |   | C | L |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| L |   | K |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| E |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+


Words:

['DEADEND', 'GLOBAL', 'GRAPHSEARCH', 'HEURISTIC', 'LISP', 'LOCAL', 'MISSIONARY', 'OPTIMUM', 'RATIONAL', 'SEARCH', '
YMMETRY']


Place the word 'CANNIBAL' in the grid starting at position (0,3) and proceeding in the direction [0,1].


Grid:

+---+---+---+---+---+---+---+---+---+---+---+---+
| A | A | B |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| D | G | A |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| M | E | C |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I | N | K |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S | T | T |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S |   | R |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I |   | A |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| B |   | C |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| L |   | K |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| E |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   |   |   |   |   |   |   |   |   |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+


Words:

['CANNIBAL', 'DEADEND', 'GLOBAL', 'GRAPHSEARCH', 'HEURISTIC', 'LISP', 'LOCAL', 'MISSIONARY', 'OPTIMUM', 'RATIONAL',
'SEARCH', 'SYMMETRY']


Place the word 'BACKTRACK' in the grid starting at position (0,2) and proceeding in the direction [0,1].
```

....



```
Words:

['SYMMETRY']


Place the word 'SEARCH' in the grid starting at position (5,1) and proceeding in the direction [0,1


Grid:

+---+---+---+---+---+---+---+---+---+---+---+---+
| A | A | B | C | D | G | G | H | L | L | M | O |
+---+---+---+---+---+---+---+---+---+---+---+---+
| D | G | A | A | E | L | R | E | I | O | I | P |
+---+---+---+---+---+---+---+---+---+---+---+---+
| M | E | C | N | A | O | A | U | S | C | S | T |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I | N | K | N | D | B | P | R | P | A | S | I |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S | T | T | I | E | A | H | I | Y | L | I | M |
+---+---+---+---+---+---+---+---+---+---+---+---+
| S | S | R | B | N | L | S | S | R |   | O | U |
+---+---+---+---+---+---+---+---+---+---+---+---+
| I | E | A | A | D |   | E | T | T |   | N | M |
+---+---+---+---+---+---+---+---+---+---+---+---+
| B | A | C | L |   |   | A | I | E |   | A |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| L | R | K |   |   |   | R | C | M |   | R |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| E | C |   |   |   |   | C |   | M |   | Y |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
|   | H |   |   |   |   | H |   | Y |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+
| R | A | T | I | O | N | A | L | S |   |   |   |
+---+---+---+---+---+---+---+---+---+---+---+---+


Words:

[]


Place the word 'SYMMETRY' in the grid starting at position (11,8) and proceeding in the direction [
backTracking number :  16
Failures :  1
```