Artificial Intelligence

Laboratory, full-time studies, year 2024/2025

Project: Strategies for solution space searching

Create an application that visualize discovering the way in the maze by using one of two basic search methods: DFS (LIFO data structure - a stack) and BFS (FIFO data structure - the queue). The result of the algorithm (the route in the maze) should be presented graphically. Application should also show the length of the discovered route. The maze is loaded from a text file. Format of the text file is given at the end of the task.

In route discovering following rules apply:

- the route cannot go through the wall (thick line in Figure 1),
- one move following directions are allowed: up, down, left or right.

Following directions must be checked when deciding on the choice of next step: up, left, down and finally right.

Additional functionality of the application (for each realized - half the grade more):

- graphical possibility of creating a new maze,
- presentation of the successive steps of algorithm,
- implementation of two methods of searching,
- comparison of two algorithms in terms of time for complete and length of discovered routes.

An example of the maze is shown in Figure 1.

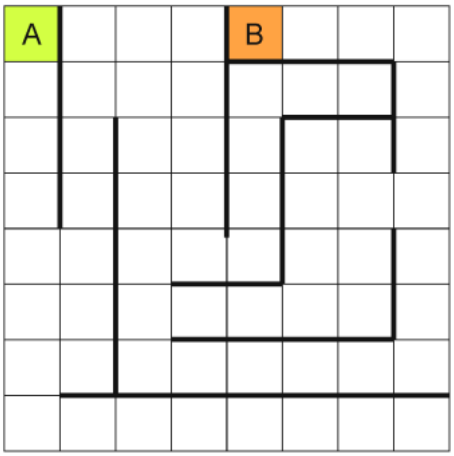

Figure 1: Example of the maze with marked entrance (A) and exit (B)

Mazes with routes discovered by two algorithms are shown in Figure 2 and Figure 3.

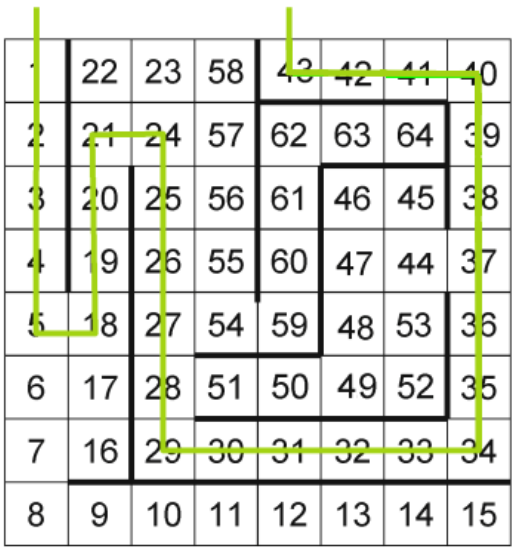

Figure 2: Route discovered by DFS algorithm

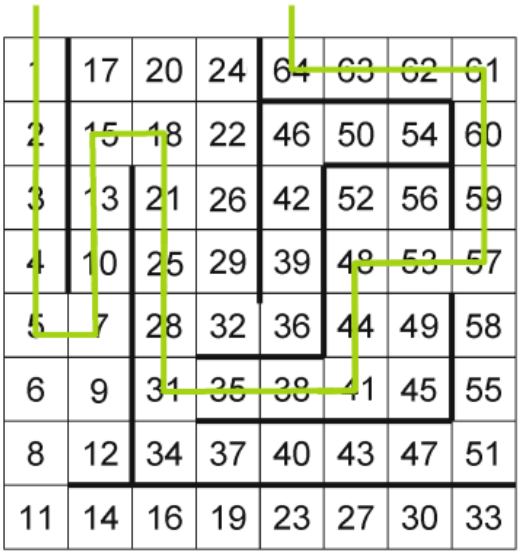

Figure 3: Route discovered by BFS algorithm

The maze shown in Figure 1 is encoded in text file with given lines:

```
 _ _ _ _ _ _ _ _
| |     |       |
          _ _ _
| |     |     | |
            _ _
| | |   | |   | |
| | |   | |     |
|   |     |   | |
        _ _
|   |       | |
      _ _ _ _
|   |         |
   _ _ _ _ _ _ _
|               |
 _ _ _ _ _ _ _ _
0,0
0,4
```

Each row contains information about horizontal and vertical lines (walls) in successive lines. Odd lines describe vertical lines, even lines describe horizontal lines. Each element defining a part of wall is separated by a space. The length of each row is identical (spaces are added where needed). The last two rows define the coordinates (row, column) of entrance and exit respectively (indexing starts from 0).