Going Further

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If you want to go further in the programming part of this MOOC, we provide you with additional material at the end of each part.

Note that this extra content does not count towards grading. You can choose to ignore it and proceed directly to the next part.

Why would you want to go further ?

The course material in this section will help you to implement AIs in the PyRat maze game on your local computer. This will allow you to create AIs to compete against your friends or other AIs.

PyRat Lab 4

During this lab session, you will program an algorithm to catch as quickly as possible all the pieces of cheese in the maze.

The goals of this lab are therefore to :

1. **Program** : implement an algorithm that searches for a path with minimal length to get to all the pieces of cheese in the maze.
2. **Test** : compare calculation times for the backtracking and the bruteforce exhaustive algorithms. What is the maximum number of cheeses for a reasonable calculation time?
3. **Analyze** : to determine the cases in which the calculation times are similar/different?

During this lab, we will program an exhaustive search algorithm to find several pieces of cheese in the labyrinth in a minimum amount of time. The"-p" option of the PyRat program will therefore be used. Remember to check that the number of pieces of cheese is not too high.

To do this we will first create the "metagraph" to reduce our problem to that of the traveling salesman.

Generating the metagraph

Write a function that, from the maze map, returns a complete graph whose vertices are the locations of the pieces of cheese and the starting position, and whose edges are weighted by the lengths of the shortest paths connecting these vertices.

Bruteforce exhaustive & backtracking algorithm

Implement an exhaustive search, as well as a backtracking solution, to find the best path for the traveling salesman problem. This function can optionally return a routing table to find the solution path, or directly this path.

Link to the labyrinth

Once the result of the traveling salesman problem is obtained, write a function to transform the solution path into a sequence of movements to move through the maze.

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