

# Programming Task 1

Autonomous systems, Aeromodelling club

NOTE that this is no longer a required task to submit, but it is highly recommended that you try it.

## 1 Path Finding and obstacle avoidance - 1

The programming tasks involves a basic common problem, and it would be best if you did not copy code, as you'll eventually have to write code on your own. But It is fine to google ideas when you are completely stuck, since that is probably the only way you will learn possibly newer concepts.

### 1.1 finding the shortest path

Use any search algorithm that works in  $O(n)$  to find a shortest path from start 'A' to exit 'B', in a grid which denotes obstacles as '#'. You can only move horizontally or vertically in one step, and only in non-obstacle cells. In the starter code, complete the `findPath(grid)` function to return all the cells visited in order from coordinate of start cell A to coordinate of end cell B. If no such path exists then return an empty list from the function.

### 1.2 finding all possible shortest paths

This one is significantly harder than the previous, and will require intuition. We will discuss later and it is fine to not be able to do it, but do give it your best shot. return all possible shortest paths from 'A' to 'B', as a list of list of tuples (or a vector of pairs, or array of arrays), where each list of tuples is a distinct shortest path.

### 1.3 Input Format

the grid is given as a list of strings, has a starting point 'A' and an ending point 'B'. the grid also has obstacles '#', and the rest are cells which you can move through. The coordinate system is (row, column) and it is 0-indexed. return a list of coordinates(as tuples) on the shortest path between A and B.

The input format given below is the one the main function can handle in the starter code (in python for now).

INPUT:

```
5
A...#
##.##
...##
.#...
...#B
```

OUTPUT (Value returned for part 1):

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

## 2 Submission and starter code

Starter code is at [LINK](#). You may or may not use it. And are allowed to use any other language.