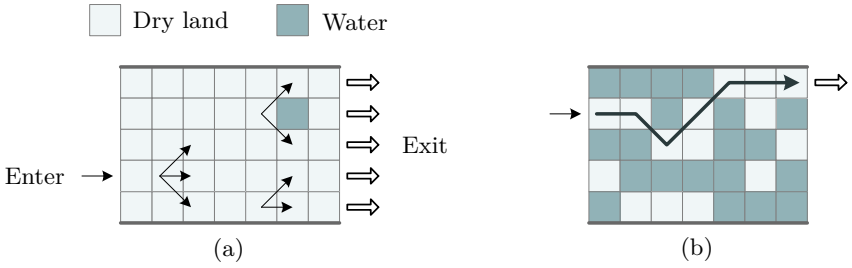
COMP304: Artificial Intelligence
Assignment One
Due Date: 29 September 2021: 23:00

Moor Traversal Problem

Consider the "Moor Traversal Problem" in which we are given an $n \times m$ matrix A that represents a rectangular swamp composed of square patches, and an initial row r. The entries of the matrix $(a_{i,j})$ can only take two values that indicate if a patch in the swamp corresponds to dry land or water. The goal is to find a path through a swamp, from left to right, by starting at a particular given patch on its left-hand side $(a_{r,0})$, according to the following rules (see Figure (a)):



- A path through the swamp can only traverse patches of dry land.
- When advancing it is only possible to move towards the right, and to a new patch that is adjacent to the old one. Note that it is not possible to move vertically.
- The path cannot cross the bottom and top boundaries of the swamp.
- The path can finish at any dry patch of land on the right extreme of the swamp.

Figure (b) shows a path through a swamp where patches of dry land and water are represented with light and dark squares, respectively.

Each problem will be represented in text file. An example is given below:

```
5
7
W W W W D D D
D D W D W D W
W W D D W W D
D W W W W D W
W D D D W W W
```

The first line is the number of rows, the second line is the number of columns, followed by each row. The "W" represents a cell with water and "D" represents a cell with Dry Land.

Instructions

1. Write a program that (35 marks) that takes as input an instance of the problem specified in a text file as described above and applies a search algorithm to find the shortest path to the end of the moor.

   (a) Your program must implements the following algorithms to solve instances of the problem:
   - depth-first search,
   - breadth-first search
   - best first search
   - A^*

   (b) Provides the user with the option of solving the problem using either the depth-first search, breadth-first search or A* algorithm.

   (c) Provide the user with an option to specify the file to use.

   (d) Solves the problem using the chosen search.

   (e) Outputs the solution path.

2. Submit a report describing (15 marks):

   (a) The heuristic evaluation function used for the A* algorithm.

   (b) A comparison of the performance of the four search methods in solving problems of differing difficulty.

Notes:

- You may implement the solution in either Java or python.
- Submit both the **source code** and you must submit **executable programs** that run without the IDE being installed on the user's system.
  - Java programs: Submit a jar file or the class files that will run. Ensure that the jar/class files can be run on a machine with only the JDK installed (please use only java version 8 or 11). NB any code requiring to be run from an IDE will not be assessed.
  - For the python program you must use python ver. 3.x The python script must run from the command line. You may use the search.py framework on the website.
- The interface can be text-based or graphical.
- Programs that do not run will be allocated a mark of zero.

Submission

- The assignment **must** be submitted on or before 29 September 2021: 23:00.
- You must use the Course website to submit. Click on **Assignments** in the Activities block (top left). Then click on **Assignment One**. You will be taken to a page which allows you to upload a file. You can re-upload a file but this will overwrite any file that was previously uploaded. **Emailed assignments will not be assessed**
- Please be warned against plagiarism. This is an individual assignment and group work is **not** permitted. The school has access to software to check for plagiarism. Cases of suspected plagiarism will either be submitted to the University proctor or a mark or 0 will be awarded to all students involved in plagiarism (i.e. students whose work is copied will also be penalized).