

Mini-Project Milestone 1

Due: June 1, 11:30pm

We will first create some sample inputs. You can use your own input file to test your algorithm, or

Step 1. Construct a text file that follows the input specifications of the problem, i.e. it can serve as a sample input. Specifically, you should give an input file representing a 10x10 patch. The patch should contain two or three islands, according to your choice. The shape of the islands can be arbitrary, but try to be creative. The text file should be of the form `firstname-lastname.txt`.

Notice that each cell in the patch is characterized by its coordinates. The top left coordinate is (0,0) and coordinate (i,j) is for the cell in the i-th row and j-th column.

Step 2. Write a function that reads an input file with the given specifications and returns the list of the coordinates of the **land** points, i.e. the list of coordinates for the 'X' points.

Suppose now that the input is an $m \times n$ patch. This means that there are mn different coordinates.

Step 3. Write a function `COORDINATETONUMBER(i, j, m, n)` that takes a coordinate (i, j) and maps it to a unique number t in $[0, mn - 1]$, which is then returned by the function.

Step 4. Write a function `NUMBERTOCOORDINATE(t, m, n)` that takes a number t and returns the corresponding coordinate. This function must be the inverse of `COORDINATETONUMBER`. That is, for all i, j, m, n we must have

$$\text{NUMBERTOCOORDINATE}(\text{COORDINATETONUMBER}(i, j, m, n), m, n) = (i, j)$$

The two steps above mean that besides its coordinates, each cell has its own unique **identity number** in $[0, mn - 1]$

Step 5. Write a function `DISTANCE(t1, t2)`, where t_1 and t_2 are the identity numbers of two cells, and the output is the **distance** between them. The distance is the minimum number of connected cells that one has to traverse to go from t_1 to t_2 . (Hint: Use function `NUMBERTOCOORDINATE` for this)

Note 1: Python is preferred, but you can use any language you want.

Note 2: This is part of the mini-project and credit will be given when it is completed. This part is worth about 25% of the miniproject grade. If you have any questions feel free to ask.