

Mini-Project Milestone 3

Due: June 21, 11:30pm

Recall that in Step 8 of Milestone 2 we wrote a function that finds `ISLAND_LIST`, where each island is a list of cells.

Step 9. Write a function `ISLAND_DISTANCE(isl1, isl2)`, which takes two lists of cells representing two islands, and finds the distance of these two islands. For this you will need to compute the `DISTANCE` function from Milestone 1.

Step 10. We will now construct a graph of islands. Consider an example for this. Suppose `ISLAND_LIST` contains 3 islands. We will assign to each island a unique number in $[0, 3)$. Then `ISLAND_GRAPH` will be a list of the following form:

$$[[0, 1, d(0, 1)], [0, 2, d(0, 2)], [1, 2, d(1, 2)]].$$

Here $d(i, j)$ is the distance between islands i and j , as computed with the function in Step 9. In other words, for each pair of islands, we have a triple consisting of the identities of the pair, and their distance. This is a complete weighted graph. The goal of this Step is to write a function `ISLAND_GRAPH` that outputs this list.

Final Step. We now have a data structure which is the adjacency list (with weights) of the graphs. To connect all islands, we need to find a **minimum weight spanning tree** for this graph. We have seen one algorithm for computing such a tree in the class. However, for this assignment, I will ask you to use the python library `networkx`.

Here is the documentation of a function that computes minimum weight spanning trees.

https://networkx.github.io/documentation/networkx-1.10/reference/generated/networkx.algorithms.mst.minimum_spanning_tree.html#networkx.algorithms.mst.minimum_spanning_tree

The task in this final step will be to familiarize yourself with this documentation. `ISLAND_GRAPH` is a list that has all information needed, and it just needs a bit more work to convert it in the appropriate format that can be handled by `networkx`. So, your task will be to do this conversion, then run the MST function and find the tree. Finally, you should compute the total length (weight) of the edges in the tree, so that the question of the problem is answered.

Note : 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. The final 25% will be for the mini-presentation that we will arrange.