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THE BURMAN TRAVELING SALESMAN PROBLEM (TSP)

LABO 8

Important:

Tenir compte de la courbure de la terre

Punir les creatures qui ont des doublons via fitness

Page 1: Provide a title, your names, school name, course, date

**6.1. Briefly explain the problem and your solution (1/2 page).**

**6.2 Provide the better route you found and the shortest path in kilometres. Is it the optimal shortest path? explain.**

We found a lot of different paths, but they all have the same shortest path that is 3346.761973 km.

Here is a list of different paths found:

[7, 12, 6, 11, 5, 4, 3, 2, 13, 1, 0, 9, 8, 10]

[3, 2, 13, 1, 0, 9, 8, 10, 7, 12, 6, 11, 5, 4]

[8, 9, 0, 1, 13, 2, 3, 4, 5, 11, 6, 12, 7, 10]

[1, 0, 9, 8, 10, 7, 12, 6, 11, 5, 4, 3, 2, 13]

[11, 6, 12, 7, 10, 8, 9, 0, 1, 13, 2, 3, 4, 5]

[13, 2, 3, 4, 5, 11, 6, 12, 7, 10, 8, 9, 0, 1]

[12, 7, 10, 8, 9, 0, 1, 13, 2, 3, 4, 5, 11, 6]

We can’t know if it is the shortest path because we can’t explore every road to check if they are the right ones. The only thing we can assume is that it is a good path result that minimize a lot the travel length.

**6.3 Describe your fitness function**

Firstly, we have a function that compute the distance with a library called [vincenty](https://pypi.org/project/vincenty/) using the [vincenty formula](https://fr.wikipedia.org/wiki/Formules_de_Vincenty#:~:text=Les%20formules%20de%20Vincenty%20sont,Vincenty%20(en)%20en%201975.).

After that, also created a function creating a matrix with all distances between cities.

In the final fitness function, for the path given, we sum all the distances between each city of the path. The score is equal to the total distance. The distances are obtained with the matrix of distances created earlier.

As it is a circular path, the last city is also the first one, when we compute the last distance between two cities, we use a modulo operation to get the first one again.

**6.4 Explain the way you encoded the solution, give a chromosome example.**

**6.5 Provide the configuration of the GA you finally used to find your better results: mutation, crossover, population size, type of selection, mutation, crossover used, number of generations. Describe the methodology or experiments performed in order to get your better results.**

**6.6 Provide relevant plots of your experiments and explanations.**

**6.7 Conclusions (1/2 page) + [optional] eventual supplementary comments (1/2 page)**

Upload to cyberlearn your zip file named name.zip including your notebook and the report in PDF.