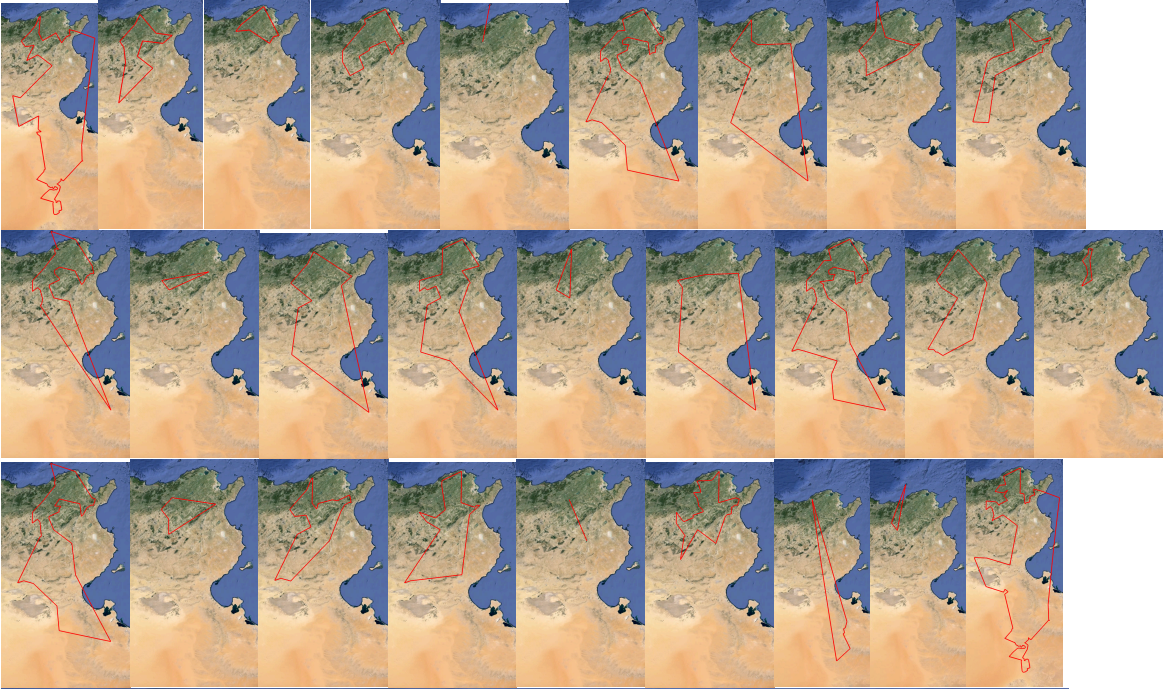


Text and TSP instances created by Rashad Zaguia.

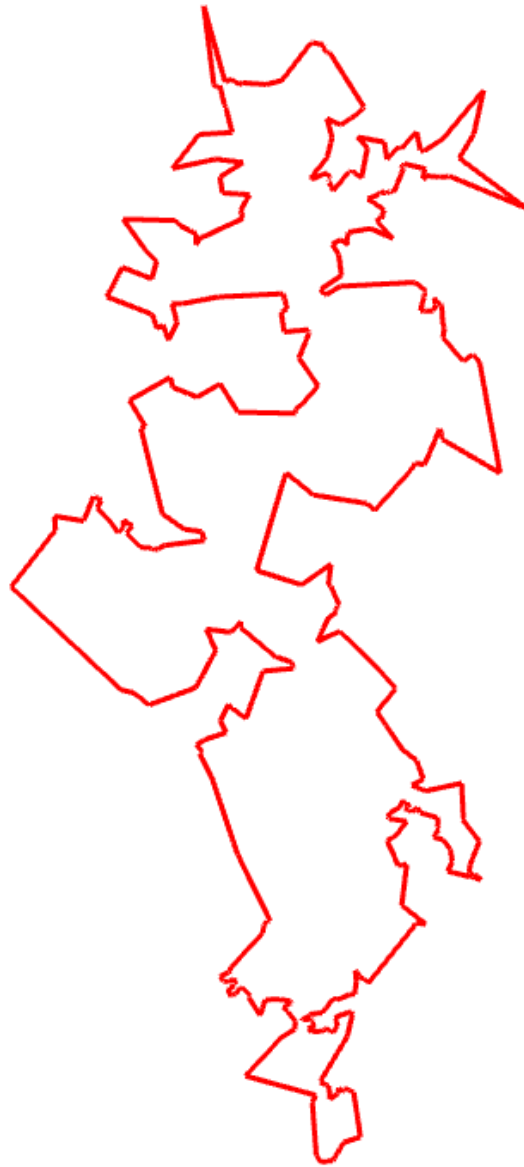
These are some of the atoms available in Tunisia:

- | | | | | |
|----------------|---------------|----------------|----------------|----------------|
| H - Hydrogen | Ca - Calcium | Hg - Mercury | O - Oxygen | Si - Silicon |
| Al - Aluminium | Cl - Chlorine | K - Potassium | P - Phosphorus | Sr - Strontium |
| As - Arsenic | Cu - Copper | Mg - Magnesium | Pb - Lead | V - Vanadium |
| Ba - Barium | F - Fluorine | Mn - Manganese | S - Sulfur | Zn - Zinc |
| Bi - Bismuth | Fe - Iron | Na - Sodium | Sb - Antimony | Au - Gold |
| | | | | Ag - Silver |
| | | | | C - Carbon |



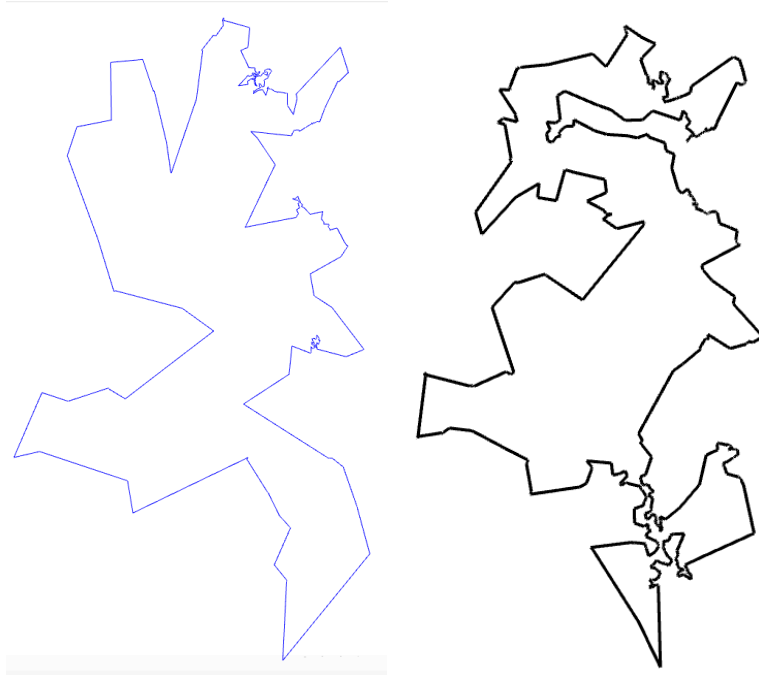
Text and TSP instances created by Rashad Zaguia.

Optimal Tsp tour of some mines in Tunisia
The west hills are more expert of land that the east.



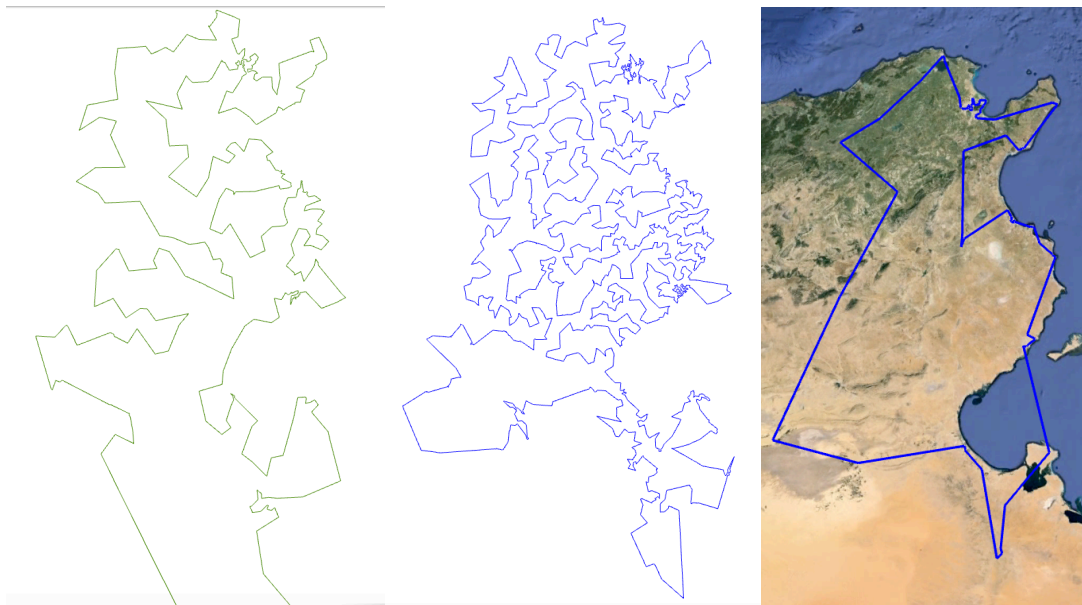
Text and TSP instances created by Rashad Zaguia.

A tour of banks (in blue) next to a tour of hotels and archeological sites (not proven optimal):



A tour of postal offices (in green) next to a tour of schools.

The one at the extreme right is a tour of faculties (it has to be checked against <http://place6.com/faculties.pdf>) in Tunisia it is one common final high school exam that determines entrance to private and public universities (it sets a market given grades). The east manages people (schooling) better than the west.



Text and TSP instances created by Rashad Zaguia.

A tour of cemeteries then one of the old 264 municipalities then one of the new 351 municipalities.

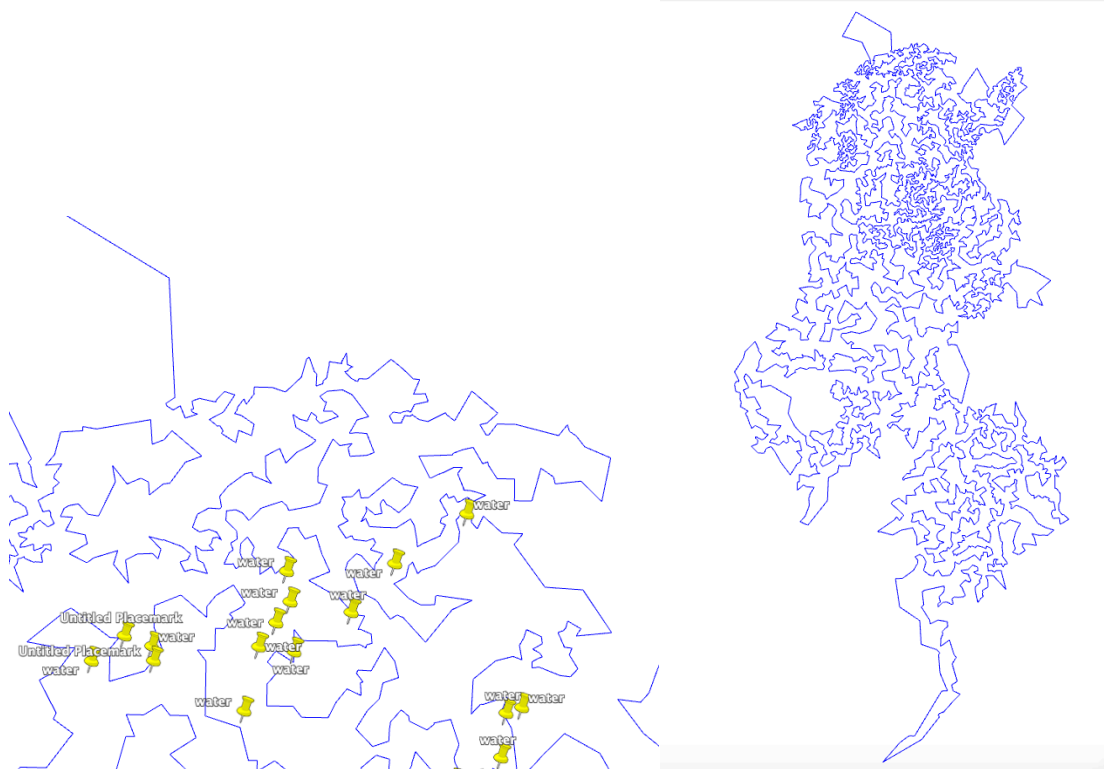
For now we can notice a miss representation of the population by municipalities (30th of march 2024). Hopefully the problem would be solved soon.

In the middle between east and west most are shepherds taking care of cattle.



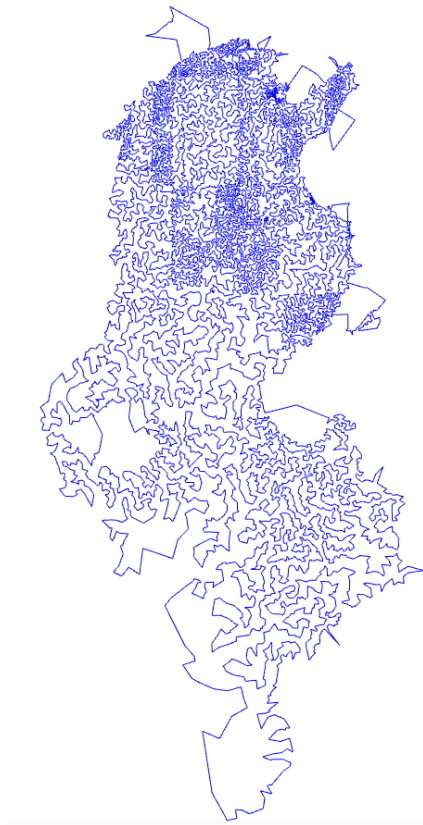
The data provided by US after checking satellite picture is not relevant.

You can see the mismatch with some water points samples in this tour of water points:



Text and TSP instances created by Rashad Zaguia.

Same for the population some points especially in the south are completely empty.
(this tour is not optimal)



Here is a kml file of google earth having all the tours:

<http://place6.com/tunisia.kml>

References:

I had to add most mines manually using my eyes, the atoms classification is from:

<https://www.mindat.org/min-233.html>

I added around 76 % of cemeteries using my eyes but did not do any effort on the rest of the data obtained from:

<https://www.openstreetmap.org>

This is an interesting link describing how to find secret grave yards.

<https://citizenevidence.org/2022/06/30/finding-clandestine-graves-using-geospatial-analysis-to-search-for-missing-persons-in-baja-california-mexico/>

Sadly, data provided by US about the population is not relevant:

<https://geonames.nga.mil>

I had the following errors with Concorde tsp it optimized well for the other tours:

<https://www.math.uwaterloo.ca/tsp/concorde/DOC/index.html>

Text and TSP instances created by Rashad Zaguia.

For the Tourism tour.

Final lower bound 3602456.000000, upper bound 3602456.000000
Exact lower bound: 3490351.480952
DIFF: 112104.519048
Time for Total: 8.46 seconds (8.46 total in 1 calls)
Final LP has 1920 rows, 5236 columns, 27976 nonzeros
LOWER BOUND: 3602456.000000 ACTIVE NODES: 1

Task 0: Branching on node 0
Do not branch, the lp is within 1.0 of the upperbound
exact pricing could not prune search - need to branch
new tour did not permit exact pruning
CCtsp_bb_find_branch failed
do_task failed
bfs_process failed
CCtsp_bfs_brancher failed

For the Banks tour

Final lower bound 2687030.000000, upper bound 2687030.000000
Exact lower bound: 2685868.000000
DIFF: 1162.000000
Time for Total: 12.30 seconds (12.30 total in 1 calls)
Final LP has 1799 rows, 4756 columns, 34841 nonzeros
LOWER BOUND: 2687030.000000 ACTIVE NODES: 1

Task 0: Branching on node 0
Do not branch, the lp is within 1.0 of the upperbound
exact pricing could not prune search - need to branch
new tour did not permit exact pruning
CCtsp_bb_find_branch failed
do_task failed
bfs_process failed
CCtsp_bfs_brancher failed