Software Instructions for Use

This tutorial makes it easy to use the Dgis program and the data it outputs. The demonstration is carried out taking as an example a random sector of the city of Cali, to represent how it works anywhere on the planet:

1. Double click on the file named Dgis.exe Figure 1 double click on the icon of the program

Dgis.exe

Figure 1 Double Click on the Program Icon

2. Once the program starts on your computer you will see something like Figure 2 program view

Figure 2 program view

3. Now we should get coordinate data, for this example we will use the base OpenStreetMap data, as it is free to use.
4. We enter the web address https://www.openstreetmap.org/
5. We select the export button, then we click on select manually Figure 3 catch
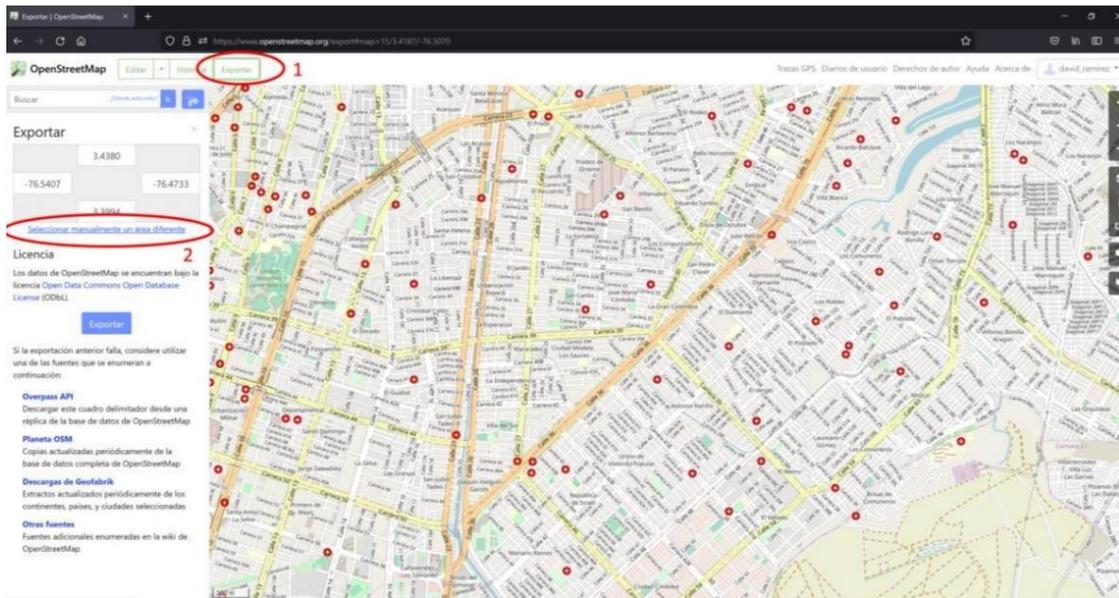
Figure 3 Capture

6. The area to be studied is chosen and the database file is downloaded by clicking on export and an image file as seen in Figure 4 capture
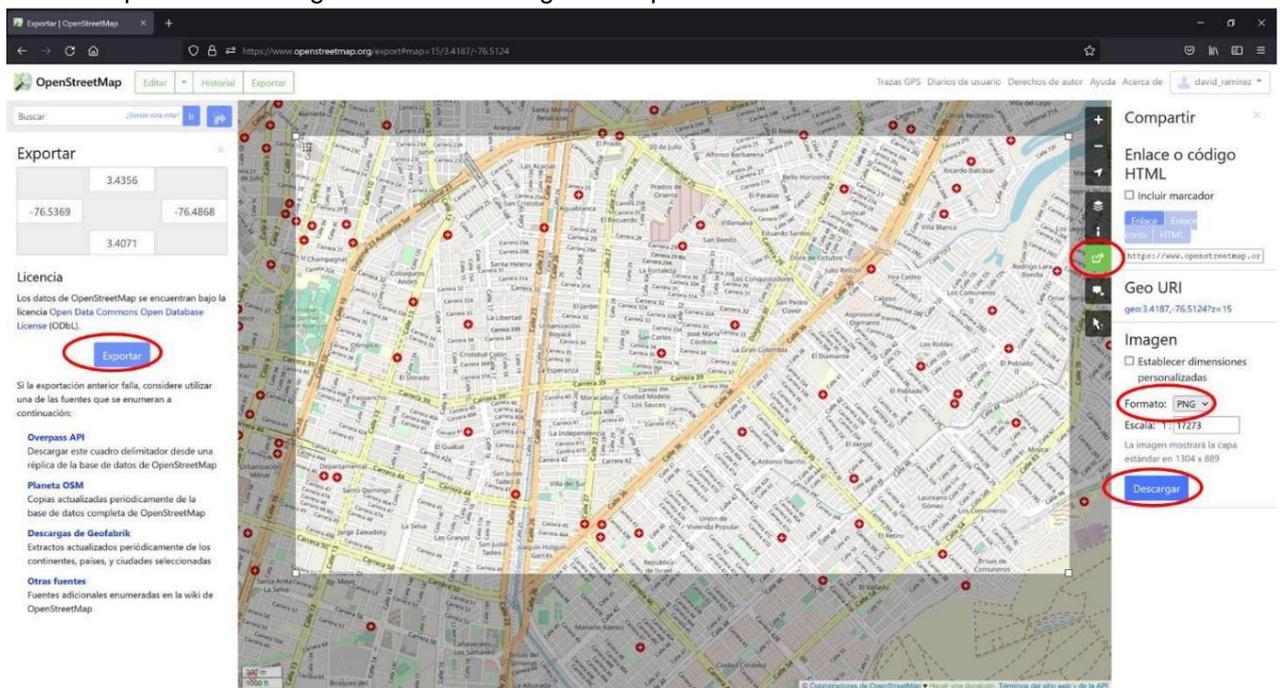

Figure 4 Capture

7. It is very important that you save the coordinate information of the image crop, which is located in the upper left corner Figure 5 capture

Figure 5 Capture

8. You will obtain two files, one with an .osm extension and the other with a .png extension, you can rename these files as you wish as long as you respect the extension, do not use spaces and make use of letters or numbers contained within the English alphabet, that is say do not use accents, umlauts, quotation marks, apostrophes, matches or special letters such as Ñ.

9. Now we enter the downloads folder and proceed to open the file with .osm extension with Excel, Libre office Calc, Open Office, Google Sheets, numbers or any other program for spreadsheets, in this example it will be explained how to use Excel because despite being paid it is an application with which many people they are familiar.

10. Right click on the .osm file that I downloaded from https://www.openstreetmap.org/, remember that you can rename the file as you wish with English characters and without spaces, choose to open with your favorite spreadsheet program Excel is used for this example Figure 6 screenshot
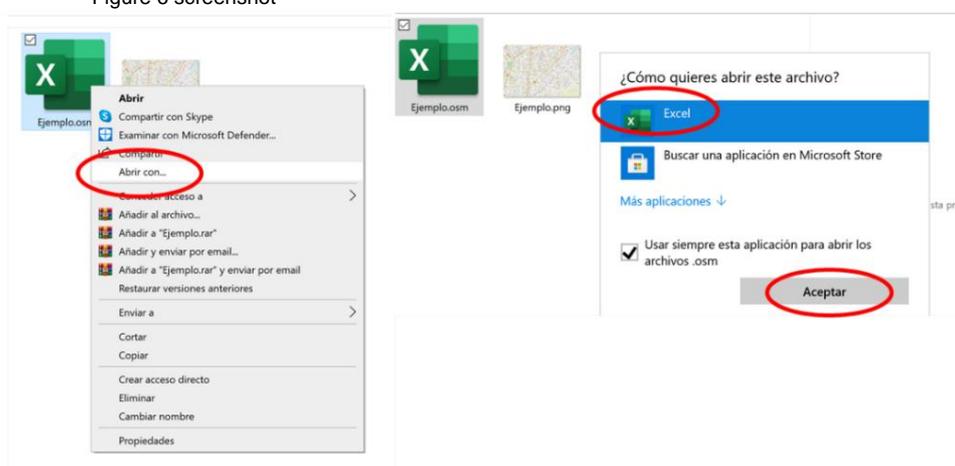

Figure 6 Capture

11. When opening with the spreadsheet program, we give it to take the data as a table XML, we accept Figure 7 capture
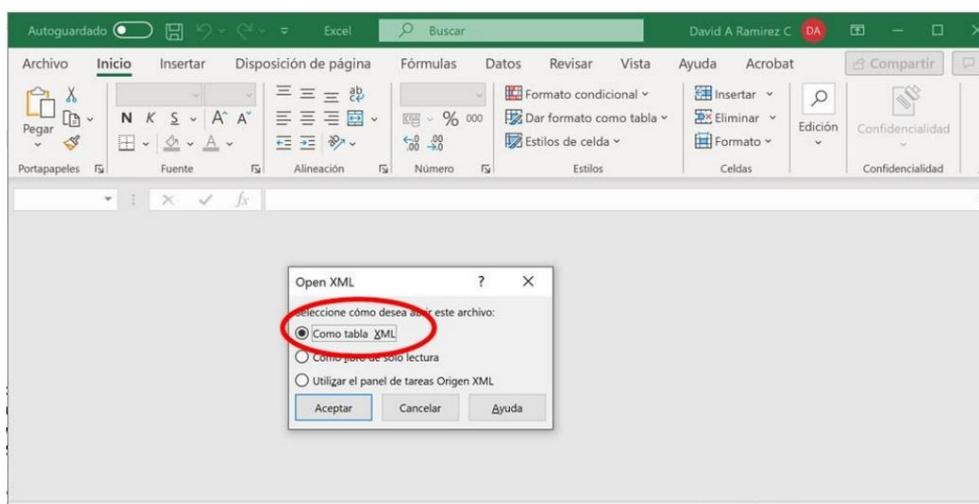

Figure 7 Capture

12. Once the program opens, we will see that there are several columns each with a title, we are interested in the column that is named with: "v" (corresponds to the name),

"lon" (corresponds to longitude), "lat" (corresponds to altitude), once these columns have been identified we will use the filter to extract all the data that we need, for this example we need the public transport stations and stops, in the city in which we are, the public transport stops have a name that begins with the word "MIO", then we locate ourselves in the name column "v" and there we select the filter "MIO". Figure 8 catch

Figure 8 capture

13. Now we simply transfer by copying and pasting the column named "v", "lon" and "lat", to a spreadsheet document and save it as an .xlsx extension, it is important not to put accents, spaces, umlauts, apostrophes or non-English language symbols Figure 9 screenshot

This document is very important because it is the document from which the program will take the necessary data to return the results, in fact you will be able to put new coordinates for existing points or future points from points of longitude and latitude that you can obtain from topographic stations, from Google maps, google erath, bing maps, OpenStreetMaps or any other coordinate provider.

Figure 9 Capture

14. Now the program must be started, once it finishes loading, some data must be entered for its operation, which are the longitude and latitude coordinates that were obtained from the openstreetmap and can be seen in Figure 5 capture, The size of the buffer to be measured in meters must also be entered, in addition to the lower limit and upper limit that denote the range to be evaluated between stops, the

range is important to eliminate stops that are very close to each other, then the evaluation of the program is shortened, however it is possible to set the program to evaluate between 1 meter and 400 meters following the example described. Figure 10 Capture

Figure 10 Capture

15. Now you should click on the "start" button, once clicked the program will ask you to choose the .xlsx file that was generated in point 13, select the file and click on open, then you just have to wait for let the program work
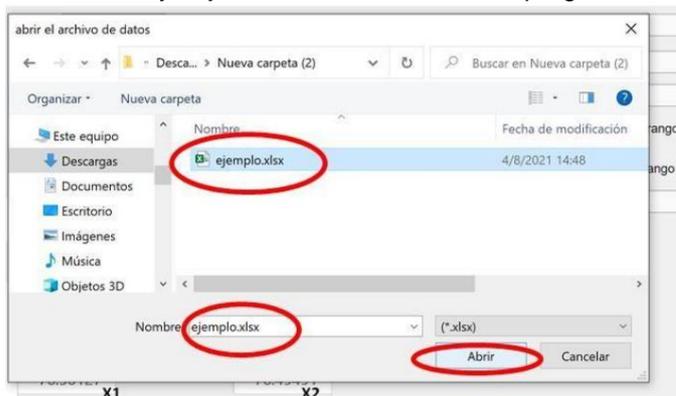

Figure 11 Capture

16. Now the program will process the information and display the results in its menu, in a window where you can see a graphical representation of the data and buffers, representing in black the area of influence reached and in white the area not reached and therefore The latter will throw a file with the name results.xlsx containing the results to be analyzed by the urban planner. Figure 12 Capture

Figure 12 Capture

17. The results.xlsx file returns information that can be seen in Figure 13 capture

Figure 13 Capture

18. The file generated in point 13, the data entry file can be modified at the user's whim by removing or adding coordinates and points according to the study to be done, these coordinates could be obtained in various ways as seen above Even so, the program has a function to find points automatically, the button is called "Find Coordinates". Clicking on this button will display a window where the program requests the .osm file and the .NPG file that was downloaded in point 6. See Figure 14 capture
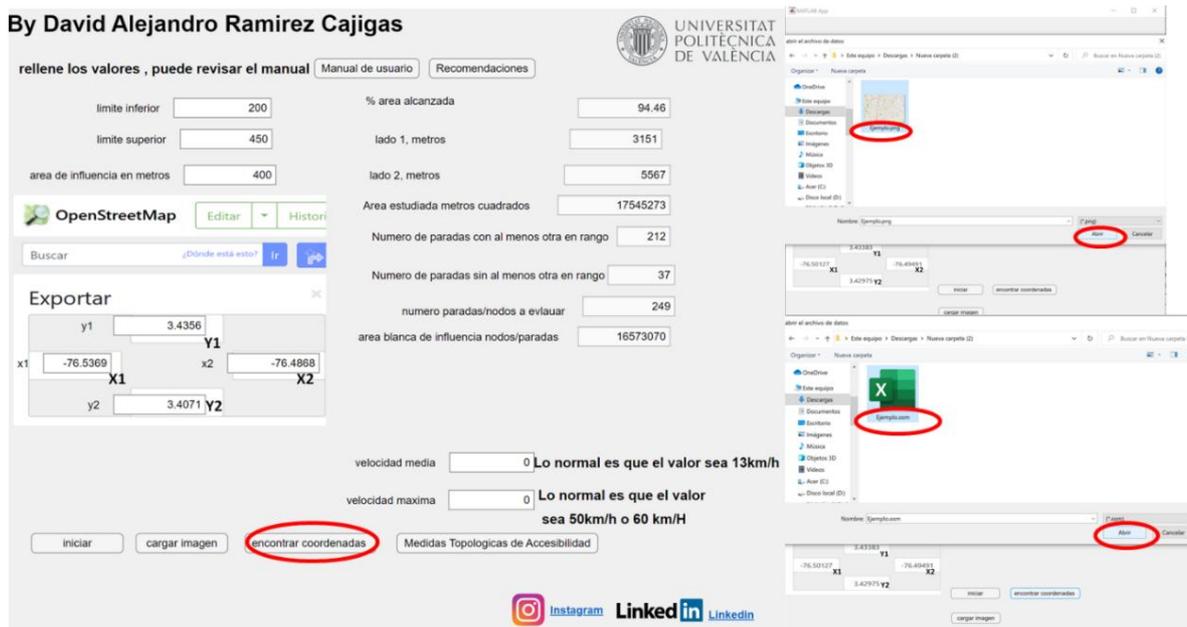
Figure 14 Capture

19. The program will process (this takes time according to the size of the file), the information and will display a map, with a pointer where the user clicks with the pointer will save a coordinate, when finished taking the necessary number of points, just close the window and a file will be automatically generated with the coordinates taken, these coordinates can be saved to be evaluated as those obtained in point 13. See Figure 15 capture
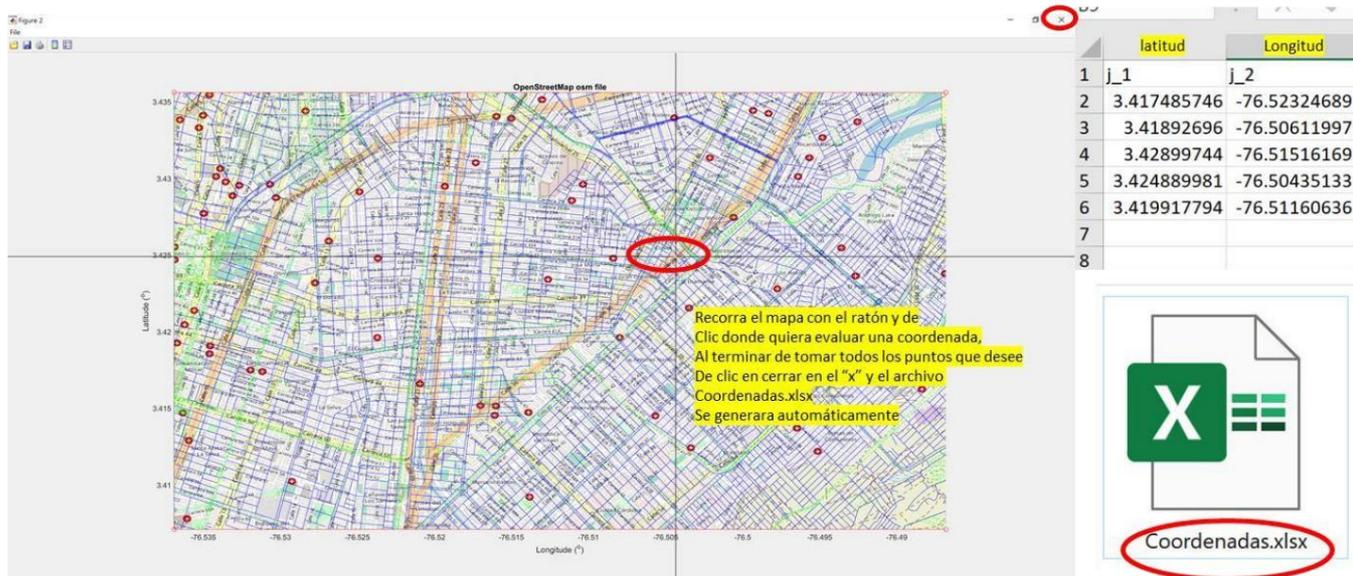

Figure 15 Capture

20. There is also a button where you can view the study map. The same data from point 18 must be loaded, but first clicking on the "load image" button, see Figure 16 capture

Figure 16 Capture

21. The accessibility topological measure meter has been implemented to measure
routes, for this the user must know the transport route to be evaluated and its nodes.

22. The average speed with which the system to be evaluated moves in the
traveled, in general this speed does not exceed 15km/h, but this can vary and must be
entered by the researcher 23. It can measure an urban or interurban route, the minimum
number of nodes must be 2
(origin and destination), there is no limit of nodes, however, the researcher can eliminate
repetitive nodes or those that are on the same street, in parallel, thus avoiding evaluating
the same node twice.

24. For this example, data from an urban public transport route within the city of Santiago
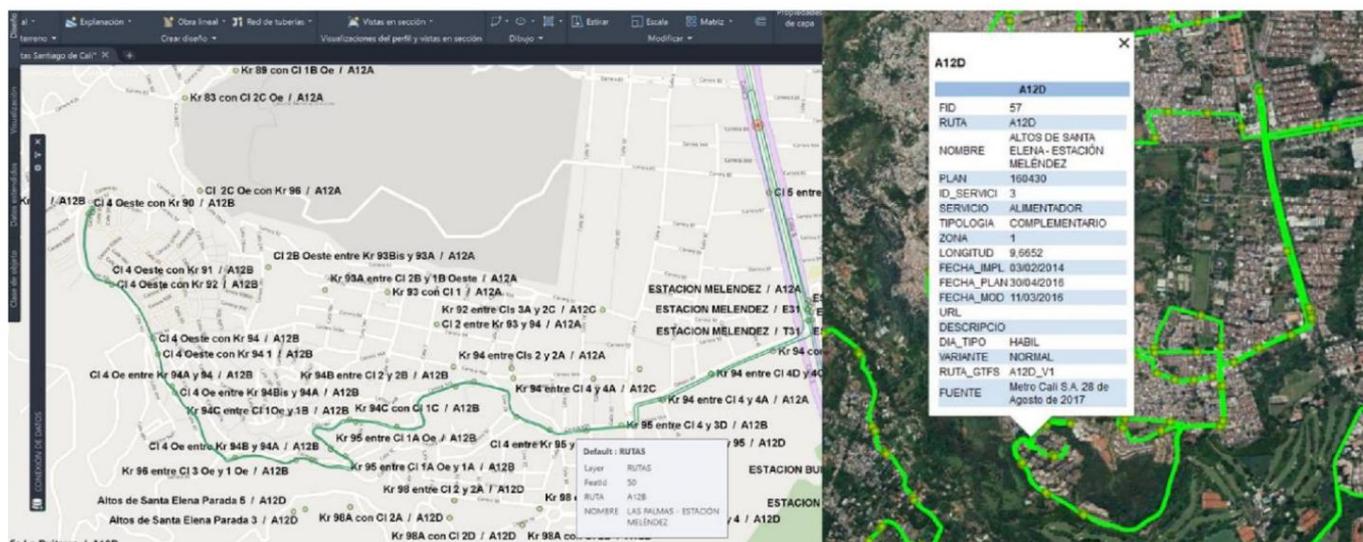de Cali will be used. The researcher needs data that is not publicly accessible in many
cases.

Figure 17 Capture of the route, using AutoCad Civil and Google Earth

25. Once the investigator has the route in mind, he must measure the distance that exists between each node you want to evaluate and the next one, always using kilometers, for this you can use multiple programs, AutoCad, Arcgis, Qgis, Google maps, Freecad, LibreCad, Qcad, Dragsight, BricsCad, etc. Figure 17 Capture of the route, using AutoCad Civil and Google Earth 26. You will need to create an .xlsx file like the one seen in Figure 18 Capture

Figure 18 Capture

27. Now you must generate an .xlsx file with the coordinates identical to the one in steps above, which columns are named v (for the name), lon (longitude) and lat (latitude), it will be very important that you respect the order you entered in the distance matrix. The coordinates can be obtained using the special function of the program for it or any other software or database. Figure 19 Capture

Figure 19 Capture

28. Now you must mark the average speed at which the transport moves on the route to be evaluated, fill in the fields of the past steps, optionally fill in the coordinates field and after that you must click on topological accessibility measures Figure 20 Capture
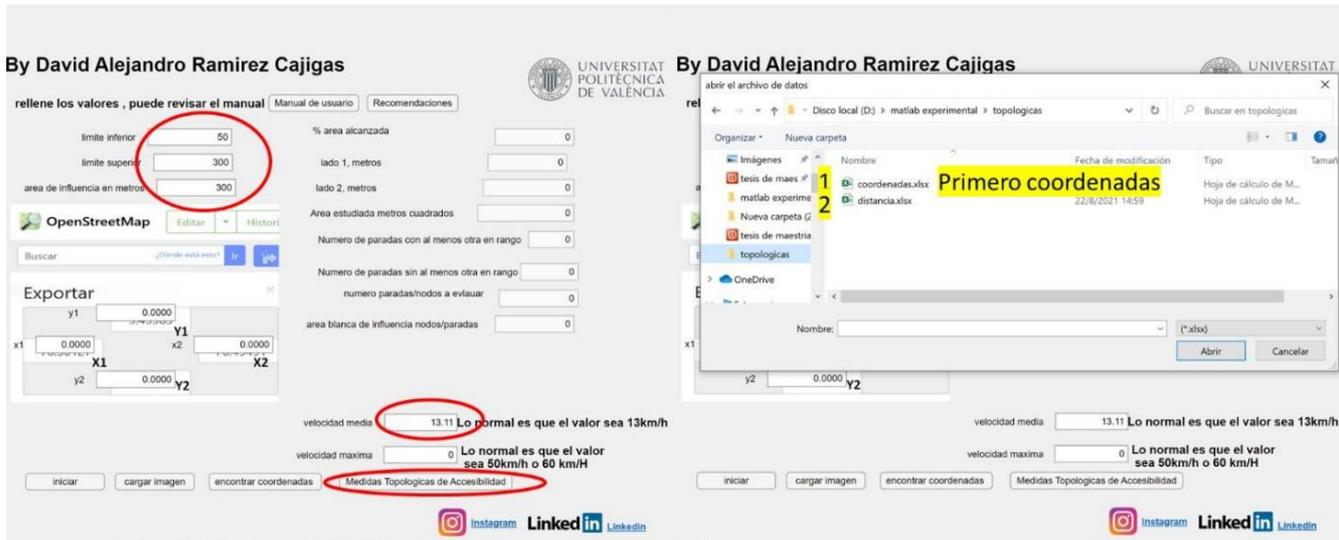
Figure 20 Capture

29. When clicking on Topological accessibility measures, a load menu is displayed, where you must first load the coordinates and then the distance matrix, the load order is very important.

30. Now the program will make the necessary calculations and then present the results on the screen and in a file named Topologicas.xlsx Figure 21 Capture

Figure 21 Capture

31. The generated file is made up of 13 pages, which contain useful arrays for the researcher to analyze the route, now the researcher can compare many routes or modify their nodes and evaluate their performance, the last page is a summary where, among other things, data such as travel time can be observed Figure 22 Capture

Figure 22 Capture

32. It is important to note that this feature is for researchers with access to route data and broader mathematical knowledge.