Journal of Young Scientist, Volume VIII, 2021
ISSN 2344 - 1283; ISSN CD-ROM 2344 - 1291; ISSN Online 2344 - 1305; ISSN-L 2344 – 1283

MULTIMODAL TRANSPORTATION NETWORK IN BRASOV COUNTY

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Abstract

Searching for a historically rich area, we have identified the Brasov area as an important tourist attraction, therefore we have found the need to create a multimodal transport network, which would make it easy to switch between many transport networks, so as to correspond tourists' need to go to tourist attractions in the area as efficiently, safely, and relaxed as possible. The transport network is made by starting from the most popular areas from Brasov for tourists to visit, creating a beautiful route for every tourist who wants to discover a part of our country. Analyzing the current transport network, the areas where these services are in high demand, the air quality, and the opportunities for improvement, a map regarding the use of a multimodal transport system has been made. With the help of ArcGIS technology, bicycle lanes, pedestrian lanes and the best public transport solutions have been created. For starters we have georeferenced the image taken from Google Earth, which contains the area studied in ArcMap. The next task was to create a data base that corresponded to the future transport network, containing the main roads and the most important attractions. In our work we have used the following apps: ArcMap, ArcCatalog, GoogleEarthPro and also TransDatRo. In the end we obtained a map made for tourists, which aids them in their traffic, as well as a panoramic view of the most important attractions in Brasov.

Key words*: Geographic Information System (GIS), multimodal transport network.*

INTRODUCTION

Our daily concern is time management so that we can enjoy more free time. For this purpose, we set out to conduct a study on optimizing a route that includes several objectives. For this study we chose the city of Brasov because it's an historical center in our country. Our main purpose was to create transport routes between the main tourist points in Brasov, in order to obtain the shortest route. To achieve this goal we have created a multimodal network which includes the bus, trolley and external networks in the are. In our study we capitalized on the most important tourist attractions, namely Brasov Glade and Fortress Rupea. Brasov, the city at the foot of Tâmpa is the ideal place for a trip to your loved ones, which attracts you and invites you to discover all that is most beautiful.

MATERIALS AND METHODS

In order to carry out the study, it was necessary to follow the following steps.
The first step was to choose the area of interest in Brasov. For this I used GoogleEarthPro app where:

1. We have identified the Brasov area;

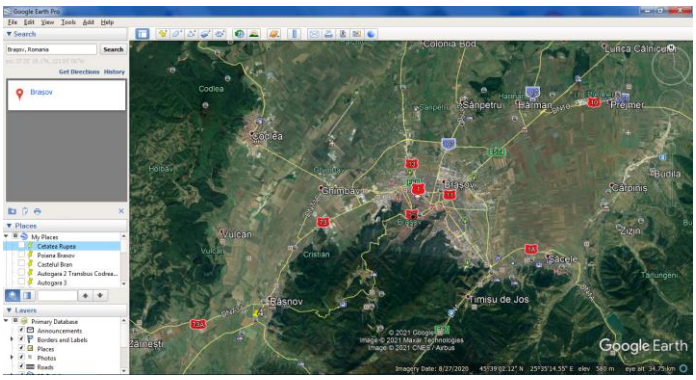

Figure 1. Area identified in Google Earth Pro

2. We have placed the check points which cover the area of interest;

Figure 2. Location of control points

3. We have obtained the coordinates of the points;

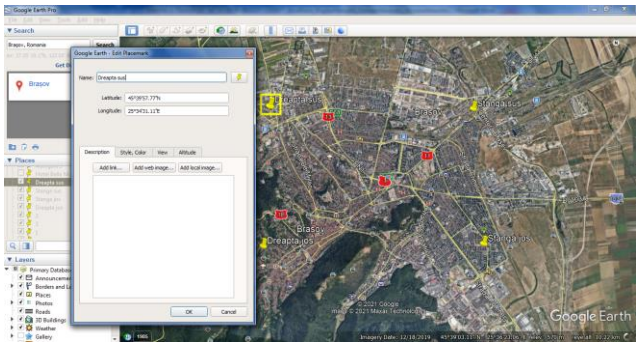

Figure 3. The coordinates of the first point

4. We saved the image to later georeferenced.

Then we used the TransDataRo 4.1. app to transform the geographical coordinates into plane coordinates.

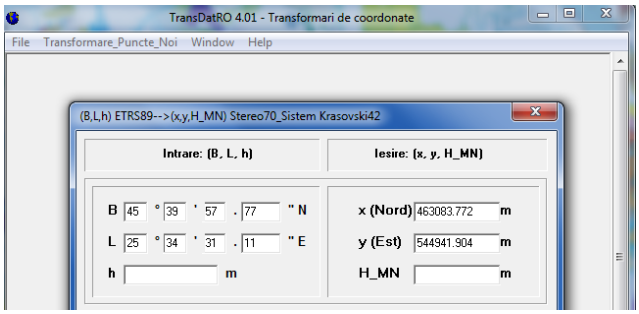

Figure 4. Transform the Geographical Coordinates into Plane Coordinates

We have created a Microsoft Excel file with the plane coordinates, useful for the georeferencing of the image.

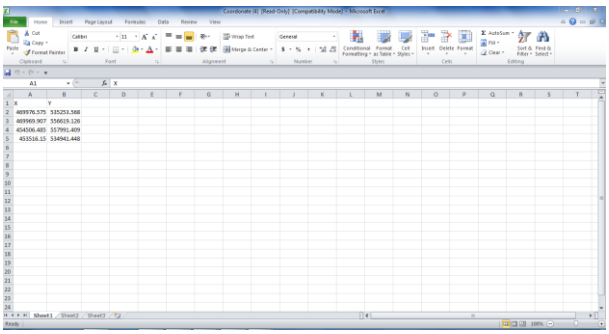

Figure 5. X and Y Coordinates in Excel

We used ArcCatalog to create a data base and data set which we later adapted to our zone.

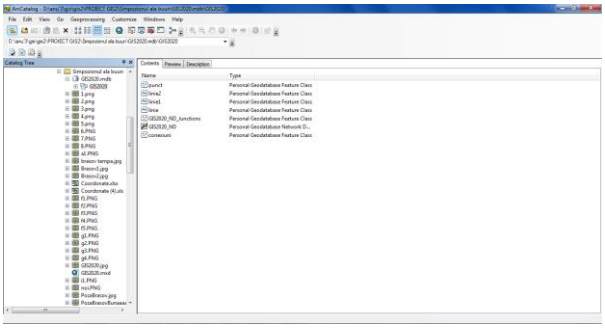

Figure 6. Picture from the ArcCatalog with the database

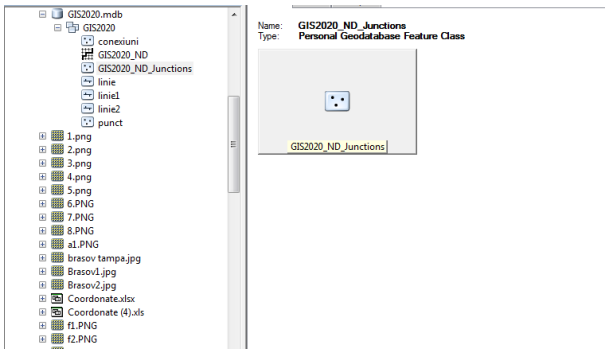

Figure 7. Creating junctions = Connecting points

In the end we used the ArcMap app where we: setup the Stereo 70 projection system; we added the image, the Excel file and data base and then we georeferenced the image.

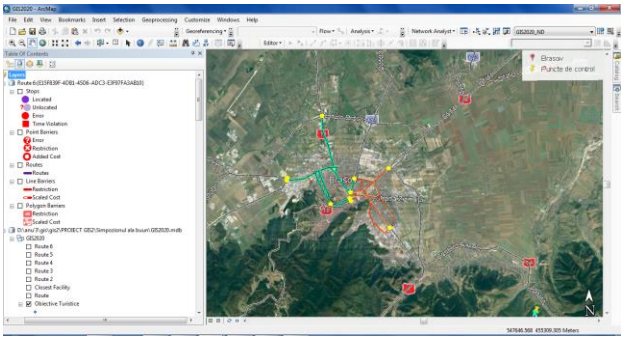

Figure 8. ArcMap picture

RESULTS AND DISCUSSIONS

The first image was save in GoogleEarth Pro which was later georeferenced in ArcMap.

Figure 9. Identify our area in GoogleEarthPro

Afterwards we vectorized the roads in our zone and we created the multimodal network.

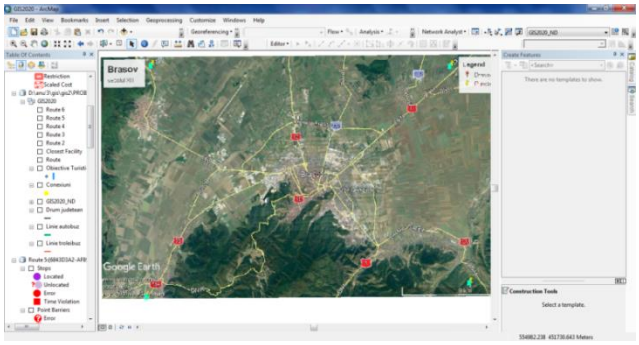

Figure 10. Georeferenced picture in ArcMap

I vectorized the county road in gray, the bus line in green and the trolleybus line in red. In the drawing you can also see the connection points with yellow, which will make the connection between the county road and the transport lines.

Figure 11. Map with all the layers

Network datasets are well suited to model transportation networks. They are created from source features, which can include simple features (lines and points) and store the connectivity of the source features. We perform the analysis using the ArcGIS Network Analyst extension, the analysis always happens on a network dataset.

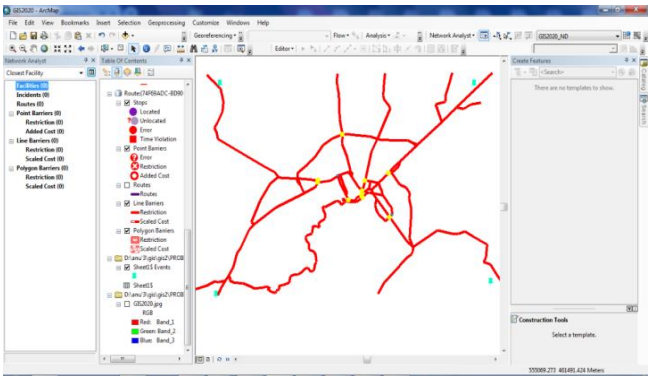

Figure 12. The Multimodal Network corresponding to our area

We used GoogleMeet to discuss and work on our project.
Due to current conditions instead of face-to-face interaction, we had to resort to different means, using the internet.
During the meetings there were discussions about the creation of the network, but also about solving the problems that arose along the way.

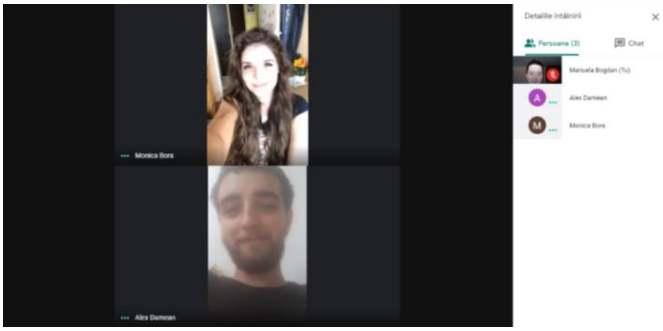

Figure 13. Our team on GoogleMeet

With the help of the teacher, I solved the small ambiguities that appeared along the way.

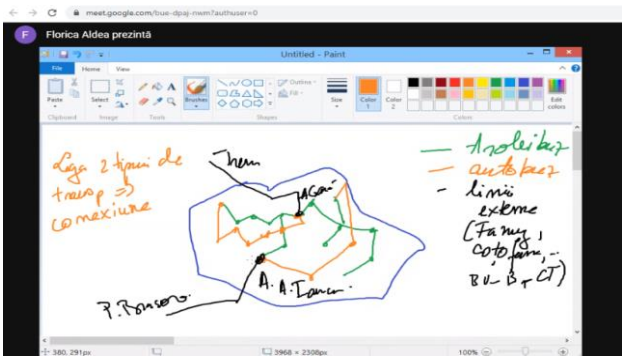

Figure 14. Collaboration sessions for the Symposium

The cladding point is represented by Codreanu Bus Station.

Figure 15. Codreanu Bus Station

Brasov Glade is the most famous winter sports resort in Romania and also an important international tourist center.

Figure 16. Brasov Glade

Figure 17. Rupea Fortress

Rupea Fortress is one of the oldest archaeological vestiges in Romania, the first signs of human settlements dating from the Paleolithic and Early Neolithic. The Rupea Fortress, as it appears to us today, covers an area of almost 11 ha with walls, towers and inner courtyards.

Figure 18. Cubix Hotel

Cubix Hotel is an elegant four-star hotel with contemporary architecture. It is the ideal place for business trips, for holidays or for organizing various events.

The objective is to determine the distance between Codreanu Bus Station and Cubix Hotel, with two stops, the first at Poiana Brasov and the second at Rupea Fortress.

Another objective of great interest is to analyze the same route if there are four restrictions as can be seen in the image below.

Also, the distance of the route was calculated with and without restrictions where a significant difference can be observed.

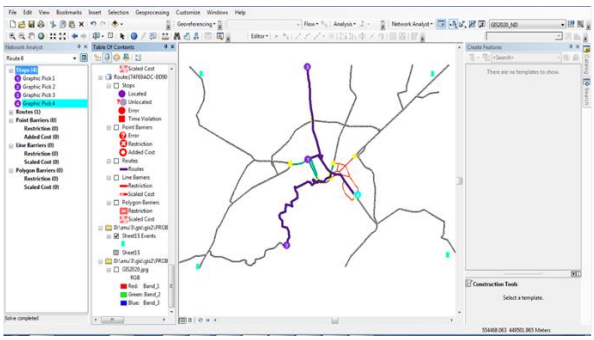

Figure 19. The route without restrictions

Figure 19 represents the georeferenced route without obstacles in which the distance was

determined, respectively 25 km from the Bus Station to the final point, Cubix Hotel.

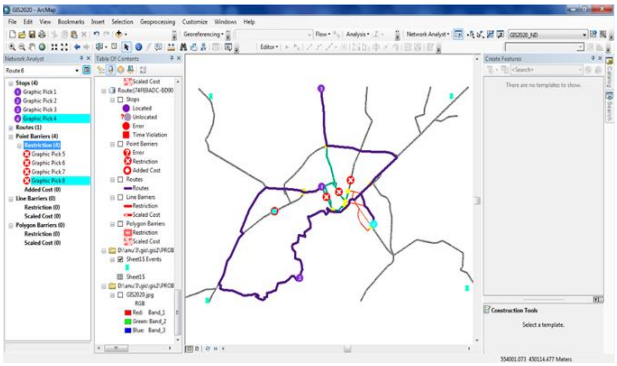

Figure 20. The route with the four restrictions

There is a clear difference between the two routes identified, the first being the fastest and the second being an alternative, respectively longer with a total distance of 34 km, starting from Codreanu Bus Station and ending at Cubix Hotel.

To exemplify our idea, we attached images in which we simulated two routes in different conditions.

CONCLUSIONS

In light of this research we can obtain with the help of the data base and the ArcMap app the shortest route between the selected tourist attractions in our analysis.

We simulated a series of obstacles which may appear, so that the program can generate the shortest route by taking them into account.

It's worth mentioning that the multi nodal network is also the basis of GPS apps.

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