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MAP TRANSFORMATION METHOD FROM ANALOGOUSOUS TO DIGITAL FORMAT

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Abstract

This article is aimed to present a map transformation from analogousous into digital format, using the latest version ArcGis 10.1 software. In order to reach the digital format, certain steps must be completed that are mentioned in the paper. All topo-geodetic works are made in the Stereographic Projection 1970 which is used in Romania today. The process begins by scanning map using a high precision scanner. Afterwards, the map is inserted into the ArcGis 10.1 program, georeferenced and finally digitized by using elements such as: point (fountains, elevation terrain, etc.), lines (roads, electrical network, rivers, etc.) or polyline (villages, forrests, orchards, etc.).

Key words*: analogousous, digital, stereographic, transformation.*

INTRODUCTION

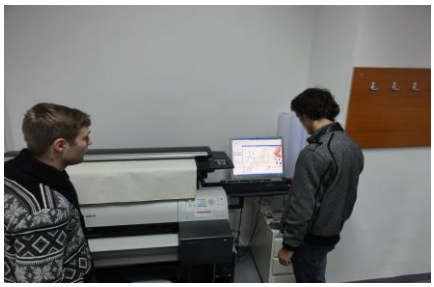
The easiest way to work with a map is the digital mode, but for this purpose the map should be transformed from the analogous to the digital format through scanning and georeferencing. The map in the digital format has a greater applicability as one can work with it in different software and tools for high precision. With the new version of ArcGis, and more exactly ArcGis10.1, we performed a complete high-quality georeference.

MATERIALS AND METHODS

To transform the map into the digital format, we scanned the map with the Canon scanner from the GIS laboratory with a 300 dpi (dots per inch) precision. The result was a JPG imagine which we introduced into the ArcGis software 10.1 where we georeferenced and digitized the map.

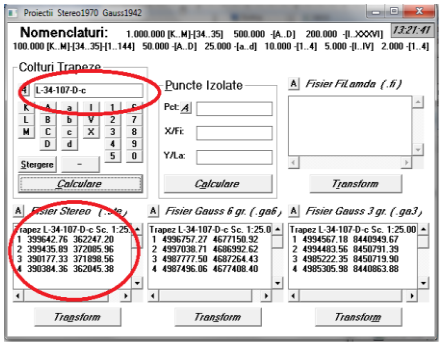
RESULTS AND DISCUSSIONS

Transformation of a map from analogous to digital format begins with scanning. For scanning, we used a 1:25000 scale map as observed in this imagine:

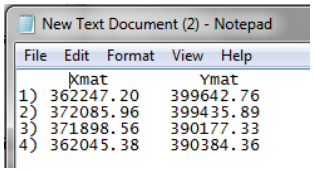


In the beginning, we transformed the corners of the trapeze from geographic coordinates in Stereographic Projection 1970. We can use several conversion softwares: TransDatRo, TopoSys, Geotools, PlanServMDI, Total Transform, Nego. These softwares are able to transform the corners of the trapeze from geographic to stereographic coordinate, or points and point files. For example, by using the Nego software, it is possible to introduce the trapeze nomenclature and the result is the corners of the trapeze in stereographic 1970 coordinate.
We introduced the map nomenclature and selected ”Calculate” in order to obtain the

corner coordinates in the Stereographic 1970 Sistem.

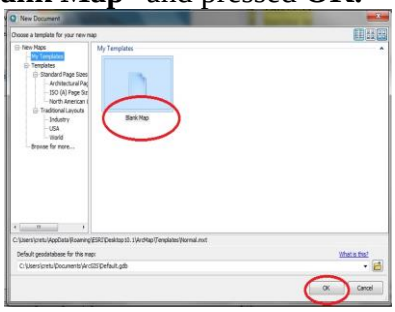


We saved the resulting coordinates to use them in the georeferencing process.

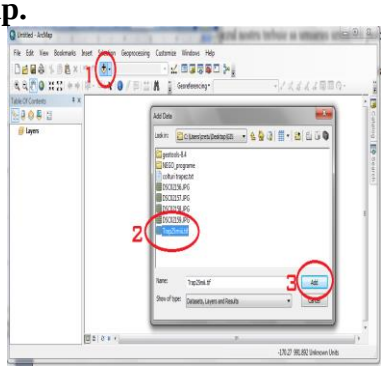


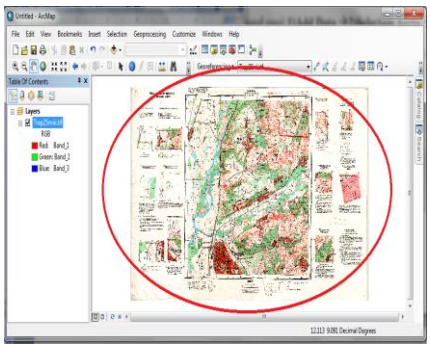
For georeferencing, we followed these steps:

1) We launched **ArcMap 10.1**, selected "**Blank Map**" and pressed **OK.**

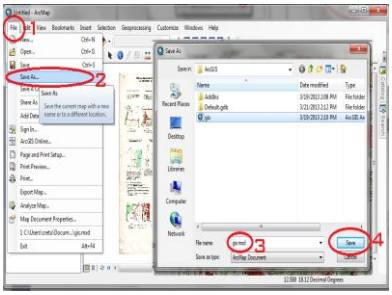


2) We brought the map as follows: **1)Add Data →2)Select map→3)Add →4)Result: map.**

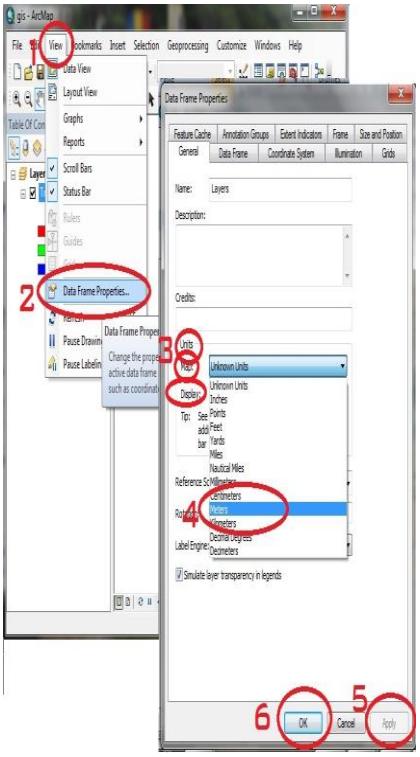


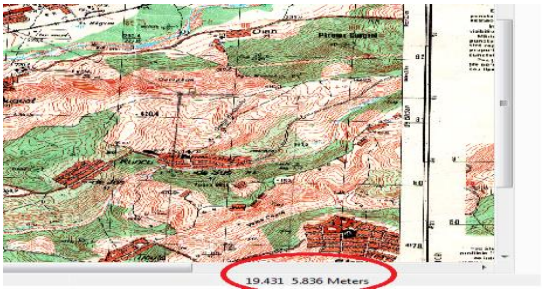


3) We saved the project: **1)File→2)Save As→Save in: C:/ArcGis→3)File name:Gis→4) Save**

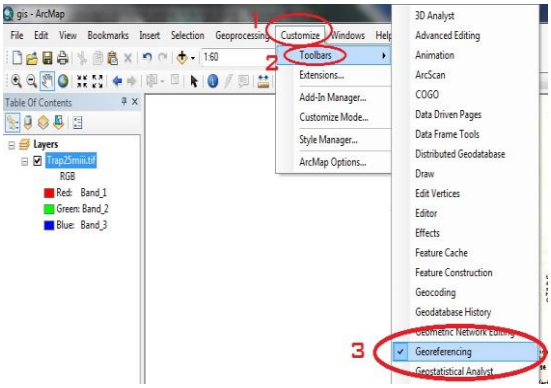


4) Then we went to: ***1) View→2)Data Frame Properties/General/→3) Units la Map si Display and select→4)Meters→ 5)Apply→6)OK***. For control, we visualized the bottom right corner of the ArcMap window where meters must appear.

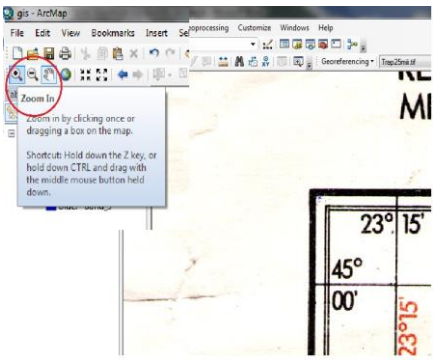




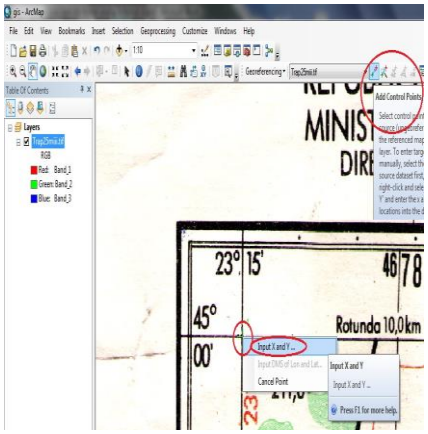
5) If **Georeferencing** is not in the main bar, we go to: **1) Customize→2)Toolbars→3) Georeferencing**, then drag it to the menu bar.



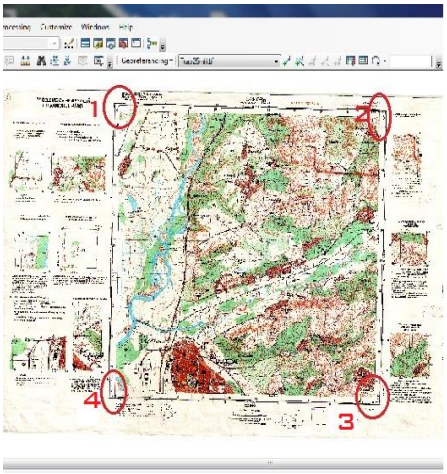
6) We zoomed the trapeze corner where we wanted to introduce coordinates by using the Zoom application from the main menu bar.



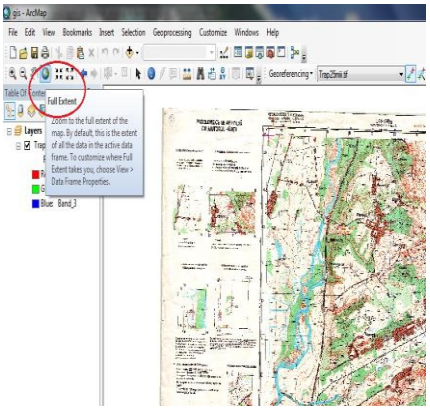
7) We zoomed in to the corner where we wanted to introduce the coordinate by using the button from the main bar. Then we selected: **Georeferencing→Add**. **Control Points** and went to the first corner which we wanted to georeferentiate. We zoomed in with ”+” button from menu bar, then clicked on the right mouse button where we were located at the intersection of the trapeze corner (the trapeze corner was given by the geographic coordinate intersection). Without moving the mouse, we pressed left click, and then right click on **Input X and Y**, then went on to coordinate introduction (remembering that they were reversed). We do the same with the other 3 corners in clockwise rotation 1,2,3,4.



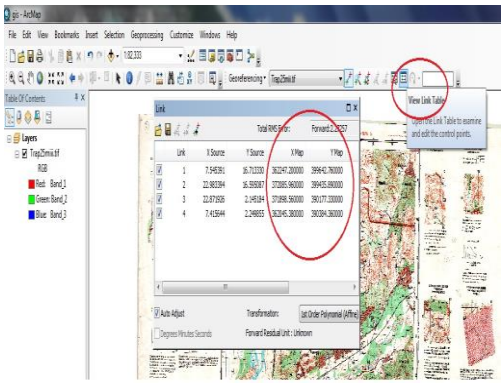
Then we introduced the coordinates X and Y of the trapeze corners, one by one. This was the result of georeferencing.



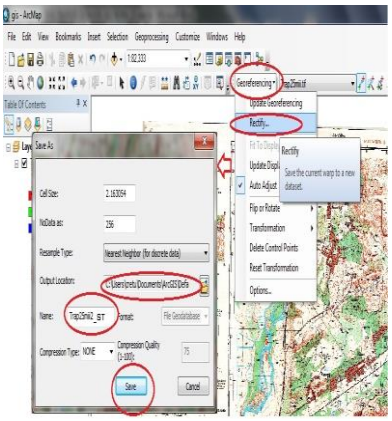
9) Then we pressed **Full extend** from the menu bar or right click on **Table of Contents/Layers/L-34-107-D-c** (the trapeze nomenclature), in order to obtain the full view of the trapeze.



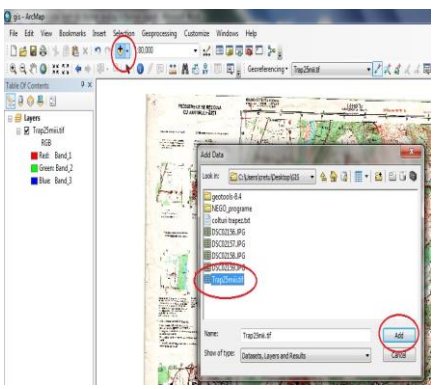
10) In order to check whether georeferencing was done correctly, we pressed left click **View Link Table**, and examined pairs X and Y coordinates of the four corners of the trapeze. We checked if we introduced the 4 pairs of coordinates in the corners correctly; if not, we selected the error and pressed **Delete**.

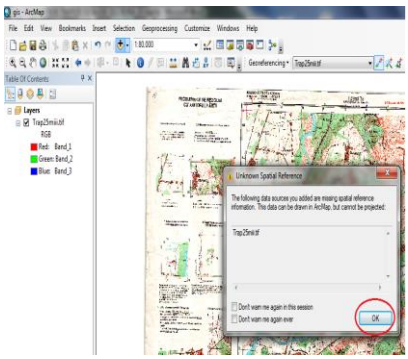


11) To save georeferencing, we followed these steps **Georeferencing→Rectify**, chose a name and Output Location: we chose the place where we wanted to save, and then clicked **Save**.

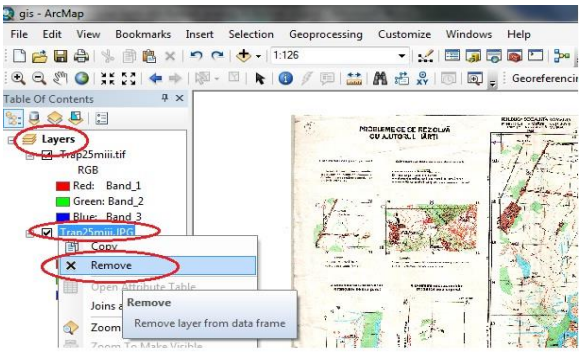


12) Then we went to the directory where we saved our geo-referenced trapeze and bought it with **Add Data** command.

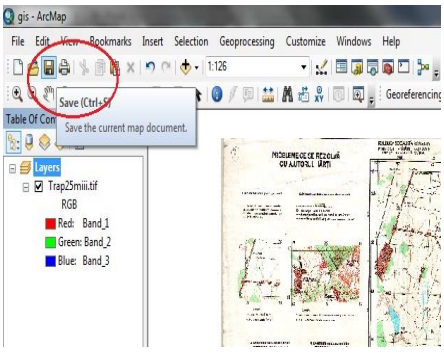




13) Then we needed the initial trapeze Trap25miii.JPG name, positioned the mouse on its name in the **Layers** palette and then pressed the right click and selected **Remove**.



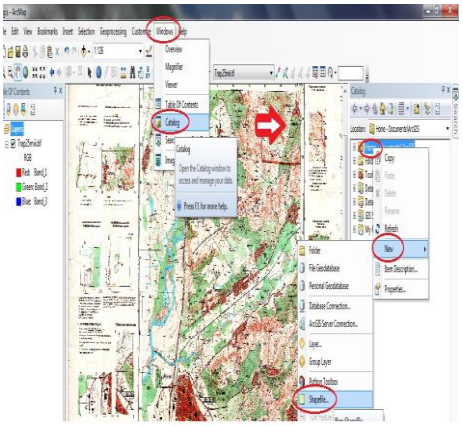
14) Our georeferenced trapezoid was a little rotated and a file with extension .tif. We can recognize that it was correctly georeferenced by reading every trapeze corner and confronting coordinates of the four trapezoid corners in Stereo 1970. Afterwards we went to the menu bar and pressed Save to end the georeferencing project.



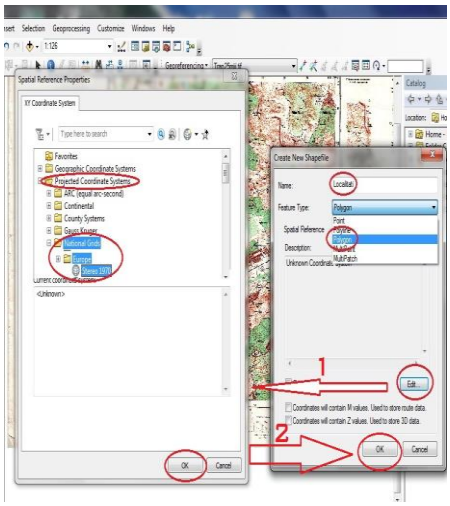
B) We created shapefiles following these steps:

1) From the menu bar we selected the **Windowsn** application with the left click mouse and selected the **Catalog** option which

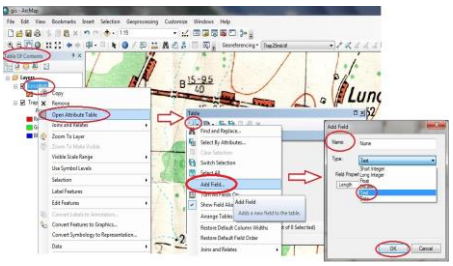
we introduced in the right part of our window. Then we pressed right click on **Home→New→Shapefile.**



After selecting Shapefile, we created the themes used for digitizing map.
The first theme that we wanted to create was called Localitati.
-**Name:** we wrote Localitati, then chose **Feature Type → Polygon**. Before pressing **OK**, we clicked **Edit** and selected **Project Coordinate System→National Grid→Europe→Stereo 1970 →OK** and then clicked **OK** to **Create New Shapefile.**



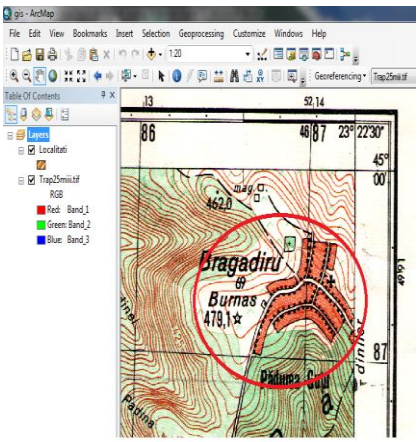
The theme created was in the left side in **Table of Contents** with the name we gave. We pressed right click on the mouse on **Localitati→Open Attribute Table→Table Options→ Add Field →** on **Name** we wrote name, on **Type** we selected **Text**, then we pressed **OK**. We followed the same procedure for the others until we introduced all the fields we needed.



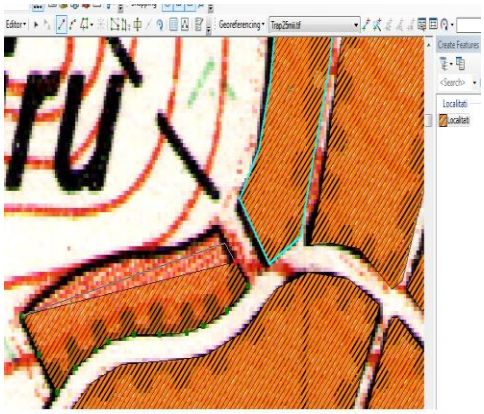
After all files were created, the Attribute Table looked as below:

This was the process of creating all the shapefiles.
For these shapefiles we chose **Future Types** such as: **polygon, polyline** and **point.**
Examples of **shapefile and Future Types** used:
- rivers (poyilines)
- lakes (poligon)
- orchards (polygon)
- leveling (polyline)
- roads (polyline)
- shares (point)
- forests (polygon)

In the following images, we present the digitization of one village from our map which in the end we should digitize completely so that it could be called a map in the digital format.
1

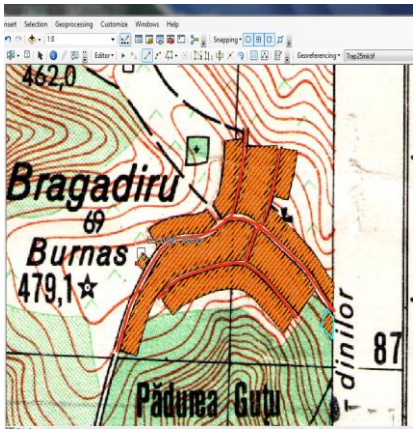


2



This is the village after the digitization process.

3



Thus, we have transformed a map from the analogous to digital format.

REFERENCES

Lucrări practice-Doru Mihai 2013