

DIGITIZATION OF ANALOG TOPGRAPHIC AND CADASTRAL MAPS FOR THE CREATION OF THEMATIC PLANS FOR THE COMMUNE OF EFTIMIE MURGU, CARAȘ-SEVERIN COUNTY

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Abstract: *This scientific work aims to highlight the use of analog topographic and cadastral maps in digital format, in order to have a better perception of the entire territory, but also to have an overview of all the geographical elements existing on it. This work contains the stages of its realization in which we have, the digitization of maps and topographic plans from analog format to digital format, in order to create a thematic map of the entire territory of the Eftimie Murgu Commune in Caraș-Severin County but also to observe its geographical elements plus territorial limits. Autocad 2013 and Raster Design 2013 were used to create this map for the entire territory. Mainly to introduce the maps and plans in these programs, we established the limits of the commune. With its help, it was possible to arrange the 1:5.000 cadastral plan of the entire County. Then, following also with the help of the territorial limit, the grid of the entire territory is made, discovering the nomenclature of each map belonging to the Eftimie Murgu Commune in Caraș-Severin County. For this, 1:5.000 military maps were used, which were attached according to the grid that was made. The entire work was done in Autocad 2013 and in Raster Design 2013 resulting in a digitized map and plan of the entire territory of the Eftimie Murgu Commune in Caraș-Severin County. Thus, we ended up having a well-established cadastral plan in which we can observe all its geographical and cadastral elements.*

Keywords: *cartography, maps, border of territorial administrative unit, cadastral plans.*

INTRODUCTION

Digital maps are maps or cartographic representations created and stored in digital form. They can be accessed and used on electronic devices such as computers, smartphones, tablets or GIS systems. Digital maps are widely used in navigation, geolocation, urban planning, terrain analysis, scientific research, video games, and many other fields.

Digitization of analog topographic and cadastral maps is an important process to convert traditional paper maps into digital format, which enables users to create thematic plans, perform spatial analysis and access geospatial information more efficiently.

Digital maps allow users to interact with geographic information. They may provide navigation instructions, enable location searches or provide additional information such as reviews and photos of places of interest (HERBEI M. V, 2011).

They can be quickly updated to reflect changes in infrastructure, new construction or changes in the topography of the area. This makes digital maps useful in land management and planning. But they can also be used in spatial data analysis, to understand geographic relationships and make informed decisions. They are used in fields such as geography, ecology, urban planning, natural resource management, cartography and business planning.

After digitizing the maps, we can create personalized thematic plans using GIS software. Thematic plans can be tailored to the specific needs of your project or analysis, such as household maps, agricultural maps, urban management maps, infrastructure maps, etc.

Cartography is the science and art of creating, interpreting and using maps. Maps are a graphical representation of geographic and spatial information such as relief, land, geographic features, road networks, rivers, political boundaries, and more. Cartography is a complex

discipline that involves the collection, processing and representation of geospatial data in a coherent and accurate way.

Maps are used for a wide range of purposes, including navigation, urban planning, spatial planning, geospatial analysis, scientific research, education and communication of geographic information.

Land measurement refers to the collection and recording of data related to the geospatial features of land, such as the dimensions, area, height and position of geographic objects. These measurements are essential for a wide range of applications, including mapping, surveying, land use planning, construction, scientific research and more. There are several methods and technologies used in land measurement, and these can vary depending on the purpose and the accuracy required.

Cartography has various applications such as topographic maps for exploration and navigation, thematic maps for urban planning and resource management, meteorological maps, geological maps, nautical maps.

Cartography has a long history, beginning with ancient hand-drawn maps and continuing with modern digital map production techniques. The history of cartography reflects the development of geographical and technological knowledge (BĂRLIBA C., 2006).

In the digital era, cartography has evolved by using spatial data collected by satellites, LIDAR technology, drones and GPS to create maps of great accuracy and detail (SMULEAC, A 2015).

Cartography plays a crucial role in understanding our world, making decisions and communicating geographic information. It has become a complex discipline involving knowledge from areas such as geography, mathematics, graphic design, technology and communication.

Cartographic maps are graphical representations of the Earth's surface or other geographic regions that show details and information about the land, relief, geographic features, transportation networks, human settlements, political boundaries, and more. These maps are used to represent our world in a concise and easy to understand way. Some common types of cartographic maps:

1. Topographic Maps. These maps show the topographical details of a region, including land relief, contour lines, rivers, lakes, forests, roads, administrative-territorial boundaries, and others. They are used in activities such as nature trips, urban planning and land use planning.

2. Geologic Maps. Geologic maps illustrate the geologic composition of a land, including geologic layers, rocks, ores, and other important geologic factors. They are useful in the exploration and exploitation of natural resources.

3. Political Maps. These maps show political frontiers, national borders, cities and capitals, to give a picture of the administrative and political organization of a region or the whole world.

4. Historical Maps. These maps represent regions and land as they looked in the past, providing insight into historical change and geographic evolution (POPESCU C, 2010).

Maps can vary in their scale (from small-scale maps representing large regions to large-scale detailed maps covering smaller areas) and can be produced using traditional or digital techniques. They are essential in many aspects of our lives such as orientation, planning, decision making and geographical research.

MATERIAL AND METHODS

The first objectives proposed in the realization of this work were the digitization of 1:5.000 military maps on a large part of the Eftimie Murgu Commune in Caras-Severin County in order to solve as deeply as possible a well-defined cadastral plan of this Commune. In the attached table you can find the nomenclatures used for the digitization of maps.

Table 1

The nomenclature of the maps used

L-34-117-A-c-1-II	L-34-117-A-c-4-I
L-34-117-A-c-4-II	L-34-117-A-c-1-IV
L-34-117-A-c-4-III	L-34-117-A-c-2-I
L-34-117-A-c-4-IV	L-34-117-A-c-2-II
L-34-117-A-d-3-I	L-34-117-A-c-2-III
L-34-117-A-d-3-II	L-34-117-A-c-2-IV
L-34-117-A-d-3-III	L-34-117-A-d-1-I
L-34-117-A-d-3-IV	L-34-117-A-d-1-III

This is one of the multiple maps that this project includes.

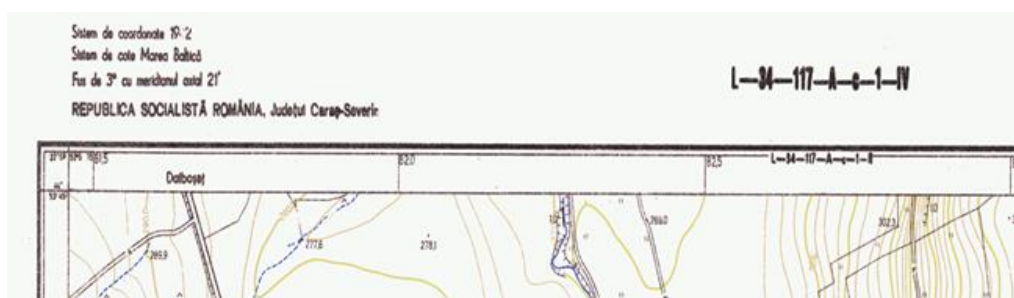


Figure 1. Topographical map L-34-117-A-c-1-IV

The methods used in carrying out the digitization study of analog maps are the following:

- Documenting this method, consists in studying the specialized literature and its technique;
- The observation method - or the land observation method - this includes the study of the entire delimited territory that includes the entire surface captured on the analog maps, and then on the digital ones. Because the land is the topographer's main study and research laboratory;
- The analysis, this method allowed the explanation of causality and outlined an overview of the entire system put into operation;
- The synthesis is given after the analysis of the maps in which the natural frameworks, the socio-economic components, etc. were very clearly observed;
- The description gives us a broad and quite detailed overview with the elements and conclusions that very clearly define the entire studied territory [POPESCU C., 2010).

The technique approached was the use of high-resolution scanners to create digital images of the maps (BĂRLIBA LUMINIȚA LIVIA, 2015).

The software used in this analog map digitization project is Autocad 2013 – Raster Design 2013.

The bonding technique was the territorial delimitation of the Eftimie Murgu Commune in Caraş-Severin County.

The materials used are:

- Analog maps with scales 1:5.000;
- Atlas of Conventional Signs for Topographical Maps.

RESULTS AND DISCUSSIONS

The specialized programs Autocad 2013 and Raster Design 2013 were used in this project.

Georeferencing is the process of assigning geographic coordinates (latitude and longitude or other coordinate systems) to data or images so that they can be placed in a spatial reference frame. This process is essential to ensure that data or images can be correctly placed on maps or geographic information systems (GIS).

In the first part, we delimited the territorial limit of the Eftimie Murgu commune in Caraş-Severin County. In which with its help we managed to find the exact location of the locality within the entire county of which it is a part.

Thus we used the sketch of the entire territorial administrative unit to be able to find its borders.

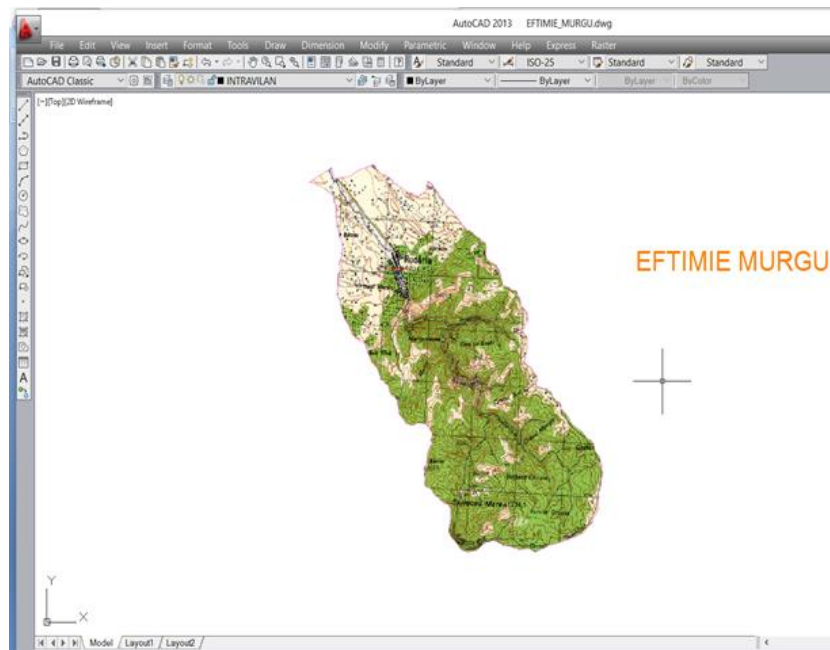


Figure 2. Sketch of the Eftimie Murgu territorial administrative unit

This is how we discovered the territorial border of Eftimie Murgu Commune in Caraş - Severin County [BÂRLIBA C - Achieving topographical works for stakingout the main elements of a trout farm] .

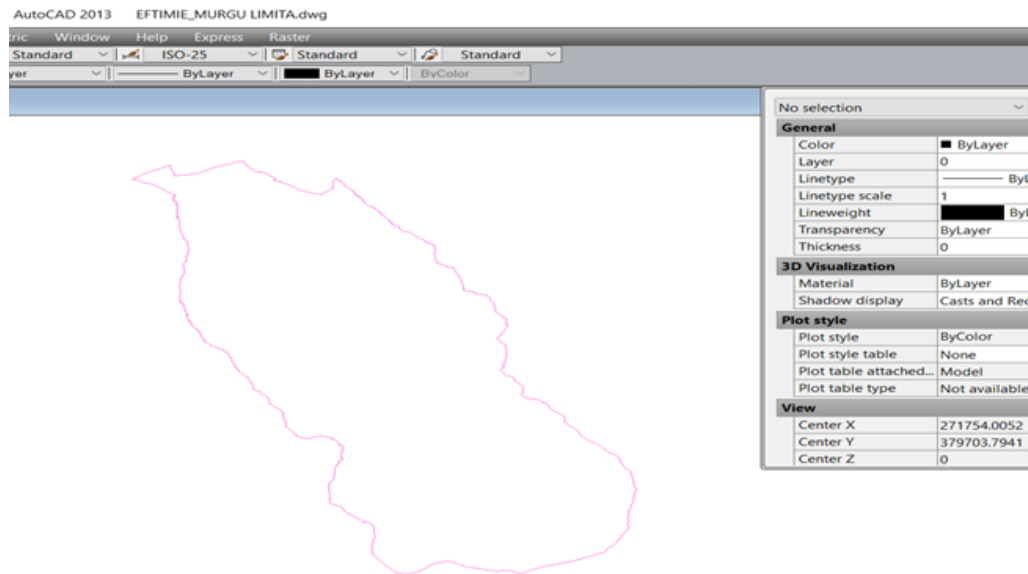


Figure 3. The territorial border of the Eftimie Murgu Commune

The second stage consists in creating layers according to the elements of the project. For a better delimitation of all its elements, as well as certain elements of the maps.

Any drawing, plan, map as long as it is entered in Autocad has at least three elements: line, point, circle, layer or color. Thus, with the help of layers, we can make them visible or invisible (close them from the layers), each element in the project itself (HERBEI M. V., 2022).

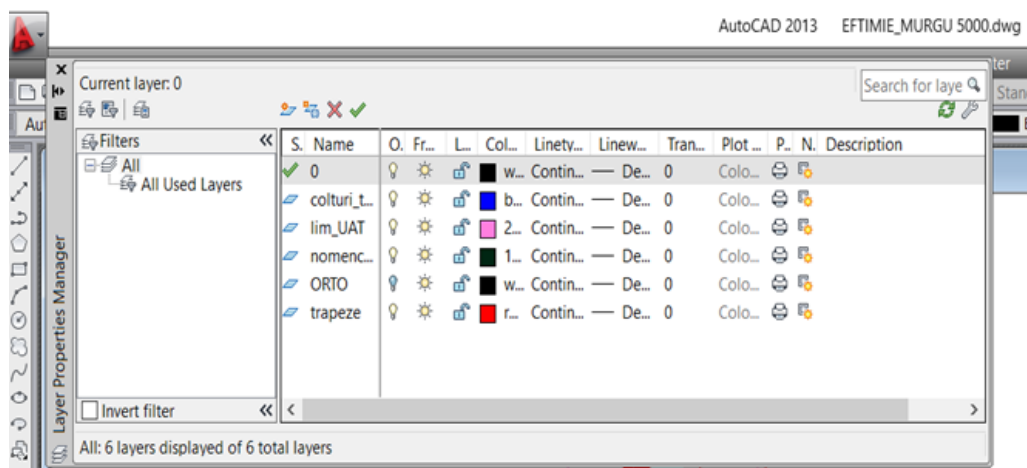


Figure 4. Creating layers

The third stage is the one in which we used the cadastral plans of the territorial administrative unit Eftimie Murgu Commune from Caraş-Severin County where with the help of Raster Design we managed to completely plan the entire commune.

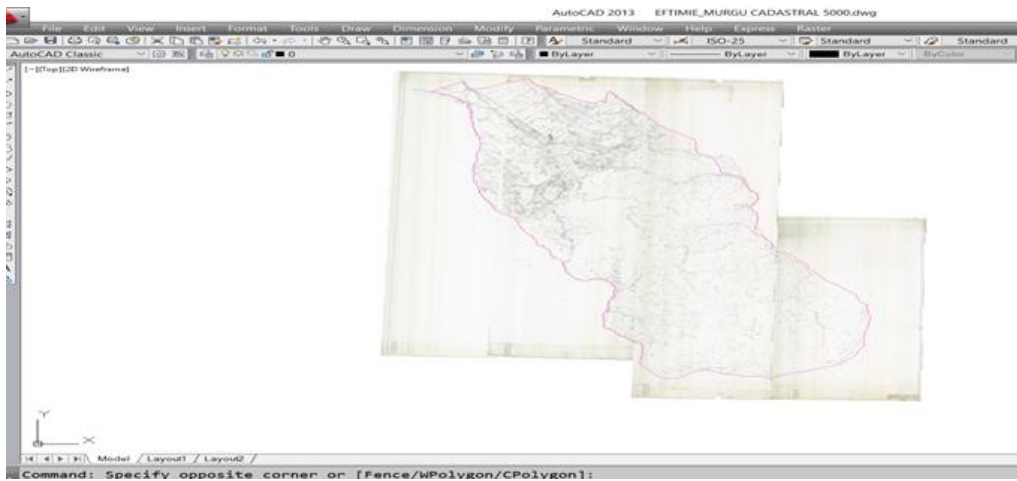


Figure 5. The cadastral plan of the Eftimie Murgu Commune

For the complete alignment of these plans that were well delimited by the border of the commune, the Align command was used to bring each piece of the related plan, to be correctly aligned and completely in coordinates.

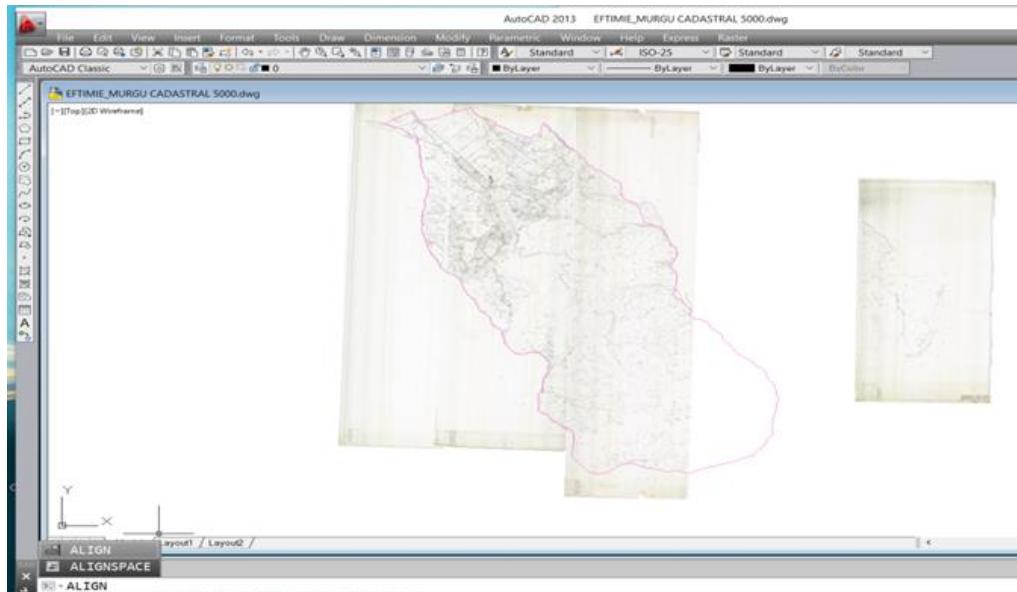


Figure 6. Alignment of plans in coordinates

In the fourth stage, for better accuracy and precision of looking at the entire territory, we made the grid of the entire territory to discover exactly each positioning of each map with the nomenclature related to this location.

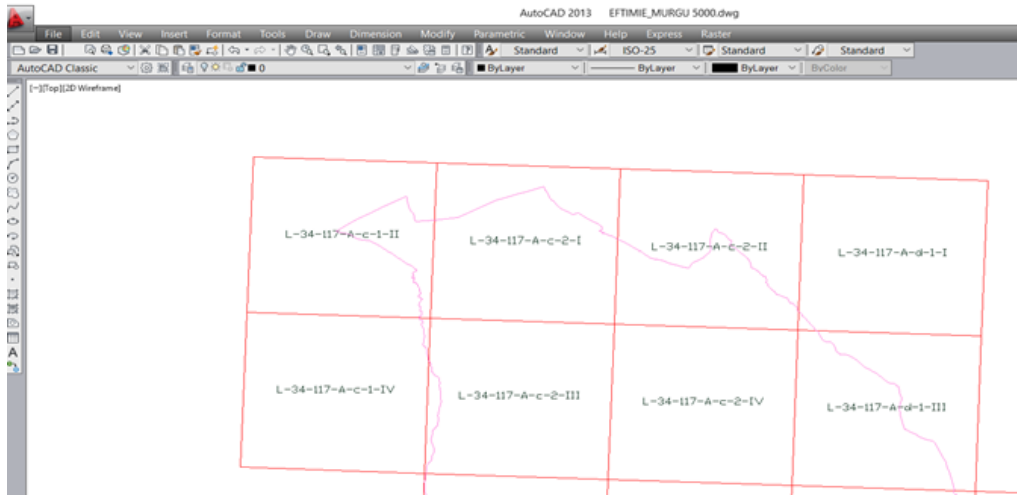


Figure 7. The grid of the Eftimie Murgu territorial administrative unit

In order to better see the existing geographical elements in this territory, we used military maps to make a complete plan of the commune (POPESCU C , 2010).

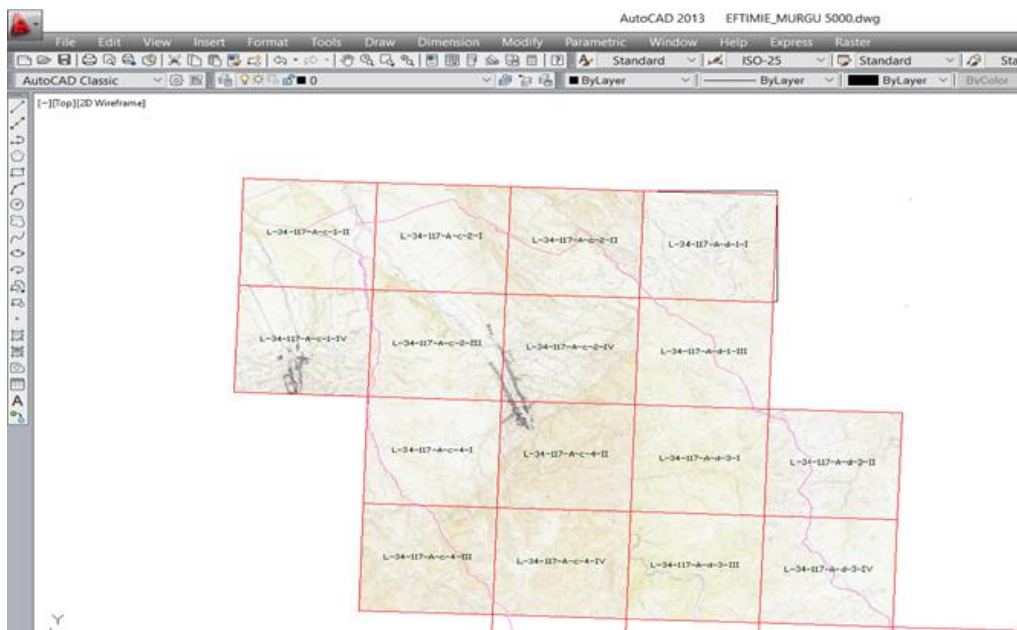


Figure 8. The final plan of the Eftimie Murgu territorial administrative unit

CONCLUSIONS

In conclusion, the digitized analog maps for Eftimie Murgu Commune in Caras-Severin County helped us to have a better perception of the entire well-defined territory and especially of its structure.

Thus, this cadastral plan aims to use it to perceive the territorial and geospatial plan of the Eftimie Murgu Commune in Caraş-Severin County; but also to have a better overview of all the geographical elements of the entire commune.

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