MAKING AND INTERPRETING DIGITAL TERRAIN MODEL

Alexandra LAZAR, Aurelia IANCU, M. HERBEI

USAMVB Timisoara ,Calea Aradului,Nr.119,Timisoara

Abstract:*Surface modeling is the process of plotting a natural or artificial surface through one or more mathematical equations. Modeling land surface modeling is a particular case of the areas that need to be taken of the specific issues related to the representation of the earth or parts of it. Digital model of an object or phenomenon, consists of a collection of data stored systematically (database) describing a three-dimensional coordinate system, arbitrary or particular characteristics of the object or form their states / achievements phenomenon (conversion as digital image) and allow adequate computer programs deduction form and characteristics of the object or phenomenon achievements Star new points. Digital model of the terrain is a "tool" information consisting of field data and software is a key component of a GIS. DEM consists of an ordered set of planimetric position information and share the points that describe the spatial configuration of the structures carrying relief and reconstruction surface facilitates their new points. Development of a digital terrain model and its future use involves the following steps 1. DTM GENERATION consisting of initial data acquisition and digital model building. This step represents a fundamental stage because the existence of errors introduced during data acquisition will be found in the DTM and will jeopardize the whole process of spatial analysis. Generating digital terrain model refers to the data acquisition module, the actual realization of the model by different interpolation methods and the choice of data structure representation (raster or TIN). 2. HANDLING DTM: correction of errors and possibly update the model, filtering operations, combining multiple sources or models from different periods, the transformation model structure (TIN - raster and vice versa); 3. INTERPRETATION DTM: analysis model and extracting useful information;April. 4. VIEW DTM: DTM graphical rendering (representations2D, 3D, animation, etc..), Closely related to the previous stage;May. 5. OPERATION DTM: developing specific applications for the desired range.*

Key words: *three-dimensional,GIS, planimetric, land surface modeling.*

INTRODUCTION

Retezat Mountains are part of the Southern Carpathians , Retezat - Godeanu group . Rises between two major depressions , Petrosani and Haţeg between two major rivers , the Great River , which delineates the North and East and West Jiu , which delimits the south . The highest peak is Mount Retezat Mountains with an altitude of 2509m Peleaga . It is a peak that can be reached quite easily from Poiana Pelegii passing by the lake Enjoy lake that can be seen in all its splendor at the height of 2509 meters of Peleaga.
The most important part of the massif is mainly composed of crystalline rocks Retezatul Mare. Located in the western part of Romania , Retezat is the oldest national park in the country, said the law in 1935 . The park has an area of 38 047 ha , of which 1,800 hectares were declared as strictly protected area called " twins " .
Predominantly glacial landscape , sheltering more than 80 glacial lakes, including the deepest (Zănoaga 29m) and most extended (Hail 8.86 ha).
Retezatul is the mountain with the largest glacial lake in Romania (80) . Of these, Enjoy lake situated at 2040m height is the largest in the country, is covering an area of 10 acres , another Zanoaga lake is the deepest glacial lake in the country is 29 m deep and the lake developed Taul Gate highest altitude - 2240m . All in Retezat there are also a lot of beautiful waterfalls .
For those who are passionate about mountain climbing Retezatul offers 40 peaks that exceed 2200m altitude .

Retezatul consists of crystalline schists , because relief is particularly spectacular glacial landscape . The south , with limestone areas , caves beautiful houses (Coral Cave , Ice Cave , Cave Iorgovanului) . Retezatul is one of the most prominent attractions of Romania. The creation in 1935 of the National Park Retezat meant a chance to get rid of disparate existing vegetation and animals here.
For hundreds of years the practice of grazing in alpine juniper led to destruction due to uncontrolled logging , and the extinction of species of plants and restricting the number of animal species. Disappeared at some point , chamois , following a national program to protect , it is again present in fairly large numbers in solid, and especially in the National Park . Other animals that now live in Retezat are Carpathian bear , lynx, grouse , ieruca and most recently marmot , a species that has been repopulated , here were built and trout . Because climate snow is on the peaks until May-June making it possible winter sports even in peak season .

MATERIALS AND METHODS

In this study we used the following materials and methods ArcGIS
ArcGIS is a product of ESRI , perhaps the use of GIS software world at current. . The company was founded in 1969 (Environmental Systems Research Institute) , headquartered in Redlands , California , USA. Initially the company is centered
the principle of organizing and analyzing geographic information, making special projects reconstruction of cities, as time is increasingly developing towards developing a set of applications which can be used in a computer to create geograpic information system (GIS or GIS). This is what today is called GIS.
The main difference between a GIS and a static map , or digital paper is the first has the capacity to be dynamic . Static maps can be observed components of map, approximate measurements can be made , but can not do complex analysis HitPark not the connection can be achieved with a spatial database , as if made a GIS map .
Each product ArcGIS Desktop includes two applications: ArcMap and Arc Catalog. ArcMap is application used to display and edit geographic data , perform analysis and create geographic reports, graphs and maps of professional quality . ArcCatalog is specific to search management and documentation related to geographic data .
ArcMap interface consists of a display box layers (Table of contents) area that displays the map , consisting of current layers (map display area) , bar menu , standard toolbar , that other applications visible depending on user need (Edit, Spatial Analyst , georeferencing , etc.) , bar and bar drawing basic tools 1for zoom , measure distances, access information about elements of the map , finding elements etc.

GIS technology is used at present in many areas of our lives, so this technology or science is studied more intensively by specialists in various fields and research, such as: education, transportation, administration, geology., agriculture and environmental protection.
A GIS system stores, analyzes and modeling spatial information for various purposes,

ultimately resulting new information having a spatial reference and with which you can perform other types of analysis and correlation of high complexity.

Contour map (Fig. 1)
Level curve is actually a isolinear joining points on the field with the same altitude. The method has grown significantly with the rise of photo-aerial photogrammetry with the tools needed to determine these isolines office - also called izohipse. Basically, the contour is determined using stereo-restitution today that allows visualization and 3D mapping. Contours are traced, according to the map scale at different equidistant. These are vertical difference of level curves. The contour can be every meter, every 5 meters, 10, 20, 50, 100, 200 etc..

Depending on equidistance is established and contour hierarchy - they are of several types : main normal and helpful . Always equidistant normal curves will be one-half of the main of and equidistant curves will be helpful to the normal half and a quarter of the main ones . Density contour analysis is another loophole relief , so the land on which it is to go through . As the contours are more frequent , the slope is greater , and vice versa ! If the field is vertical , it is impossible to play the contour , because - in plan - they are close enough that the distance between them could not be seen with the naked eye.
A desktop application that uses the contour is to determine the density gradients - or how steep (numeric) will be the route that we climb . In other words , knowing equidistant curves and flat distance between them, we can get the angle of the slope .

3D model (Figure 2)
Surface modeling is the process of plotting a natural or artificial surface through one or more mathematical equations. Digital elevation model (CDM) / DigitalElevationModel (DEM) generally refers to a digital representation of ground surface through altitude values. These uniforms are arranged forming a matrix represented by a network of cells with regular shapes, most commonly squares and triangles or hexagons less.

The main methods of data acquisition to achieve DEM
3D models of land are used to more easily analyze the characteristics of the land or building and make the best decisions for construction (roads, railways, power lines, etc..) Or development of green space (skiing, amusement parks, etc..). Such land 3D models are used to determine flood risk and those of construction are used to determine the quantities of materials needed to rehabilitate them but also for tourism.

Table 1
The main methods of data acquisition to achieve DEM

Data Acquisition Method	*accuracy MNT*	*observations*
topographical	*Very high*	*Small-scale projects. Method can not be applied in very rough areas.*
aerial photographs (stereoscopic method)	*high*	*Large scale projects / medium .. The error increases with landscape fragmentation and slope.*
Satellite images (stereo-autocorrelation)	*Medium/high*	*Large scale projects / medium .. The error increases with*

		landscape fragmentation and slope.
Digitizing contours on topographic maps and plans	*Low/medium*	*Projects at different scales depending on the source map scale.Not recommended for very small areas as topographic maps do not capture enough points characteristic.* *Lack of information if steep, rocky ridges or saddles is another problem: uniformity relief between the contour lines.*
GPS	*Medium/high*	*Projects for small areas; method limited GPS performance.* *Forest areas unusable and / or landforms which may screen the signal from the satellites.* *Very useful for more detailed data collection.*

Land surface slope map (Figure 3)
Slope of the land surface is its inclination from the horizontal plane. Basically, it is given by the angle between the plane of the earth's surface and the horizontal plane.
Calculating slope in right triangle is determined by land surface plane, vertical plane and the horizontal plane using the tangent function.
Slope is one of the parameters used geomorphometry it being related to the intensity of geomorphological processes.
The slope may be expressed in degrees or as a percentage.
Slope orientation map (Fig. 4)
The exhibition refers to the earth's surface its orientation toward the cardinal directions. Generalized form, the exhibition can be determined simply by reference to the north, but mathematically correct form, geometric, and methodological exposition depends on the inclination of the earth's surface.

MODEL TIN - Triangulated Irregular Network (Figure 5)
TIN model is created of a set of points x , y , z .
When creating a TIN model each node will be the entry point (tip) of a triangle . The nodes are connected by lines which form the sides of right triangles . The distance between the points forming the triangle vertices is always minimal
For each triangle is stored coordinates and attributes of the three peaks , topology and slope and direction of slope of the surface triangle .
The final product will be a continuous surface formed by triangles .
Interpolation methods such triangulation , following which a structure is obtained TIN (Triangular Irregular Network) are also multiple . The best is Delaunaycare interpolation allows for perfectly circumscribed circles of triangles , so that the distance between points that form the vertices of the triangle is always minimal. For each triangle is stored coordinates and attributes of the three peaks , topology and slope and direction of slope of the surface triangle .

RESULTS AND DISCUTIONS

After data processing were performed following digital maps .

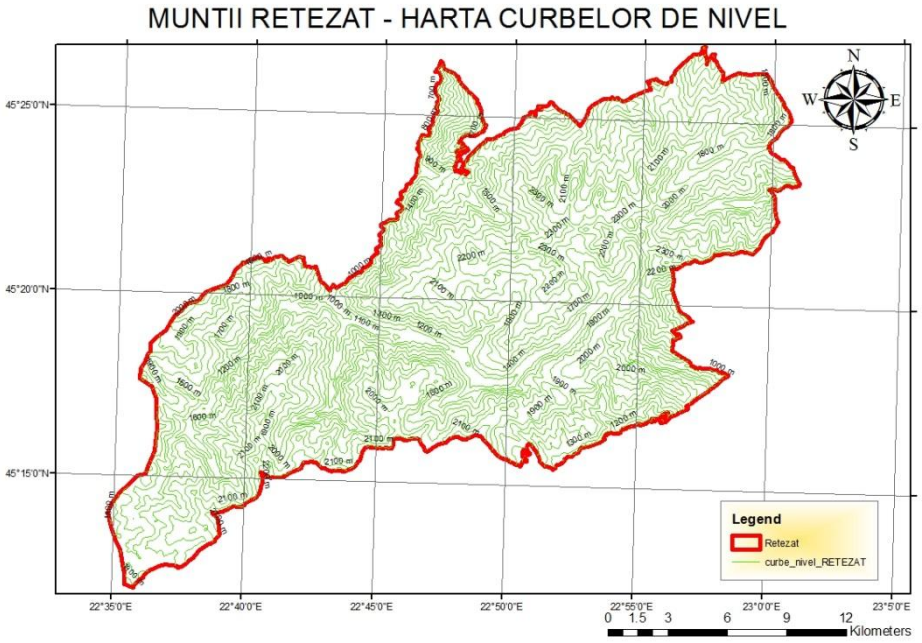

Fig. 1 Map of contours in Retezat Mountains

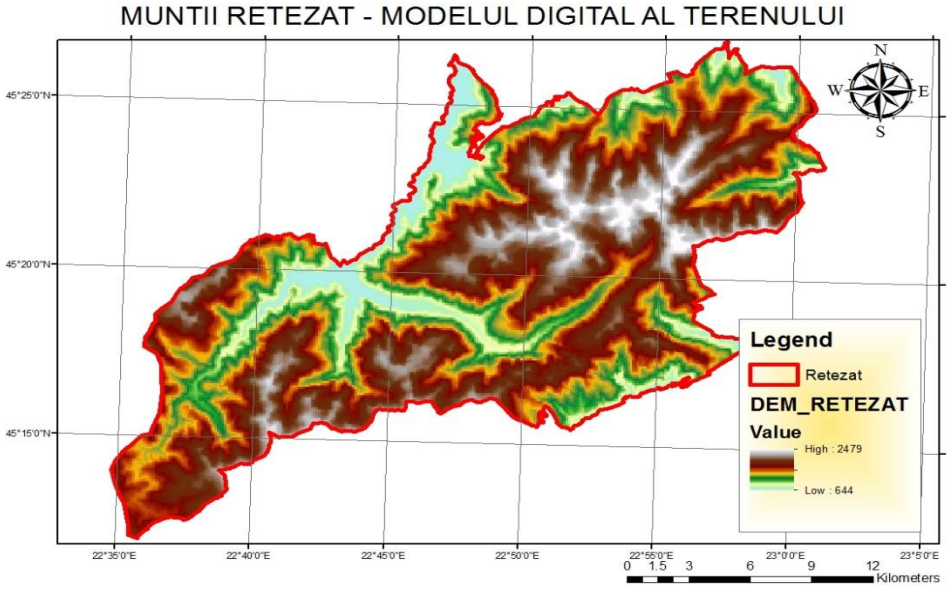

Fig.2 Digital model of the land in Retezat Mountains

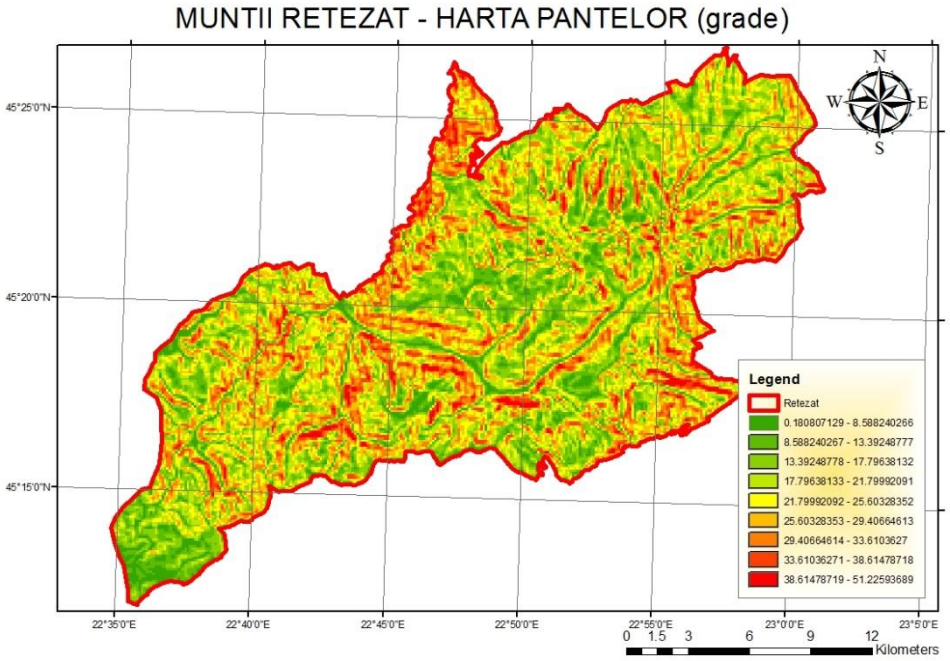

Fig.3 Map of slopes in Retezat Mountains (degrees)

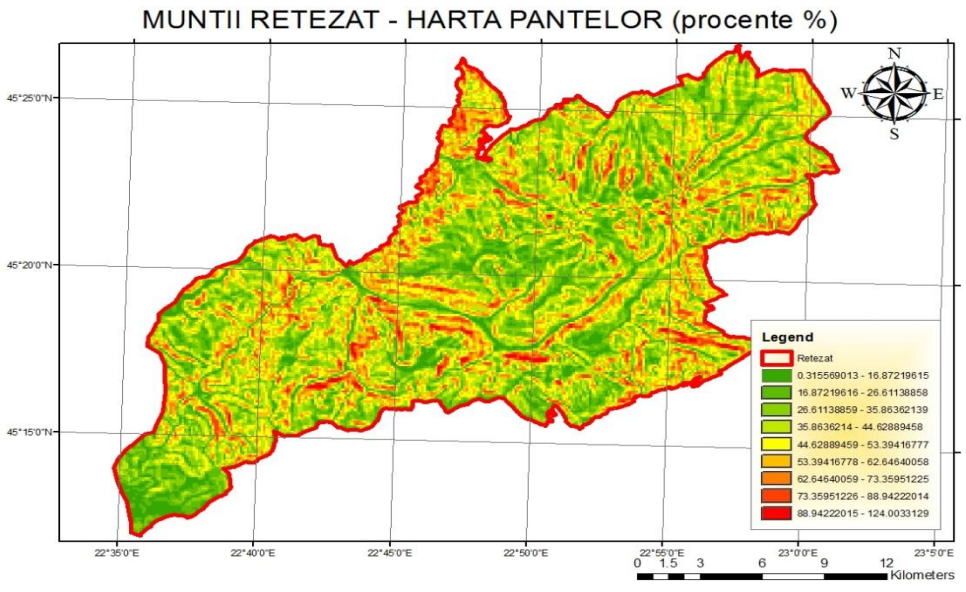

Fig.4 Map of slopes in Retezat Mountains (%)

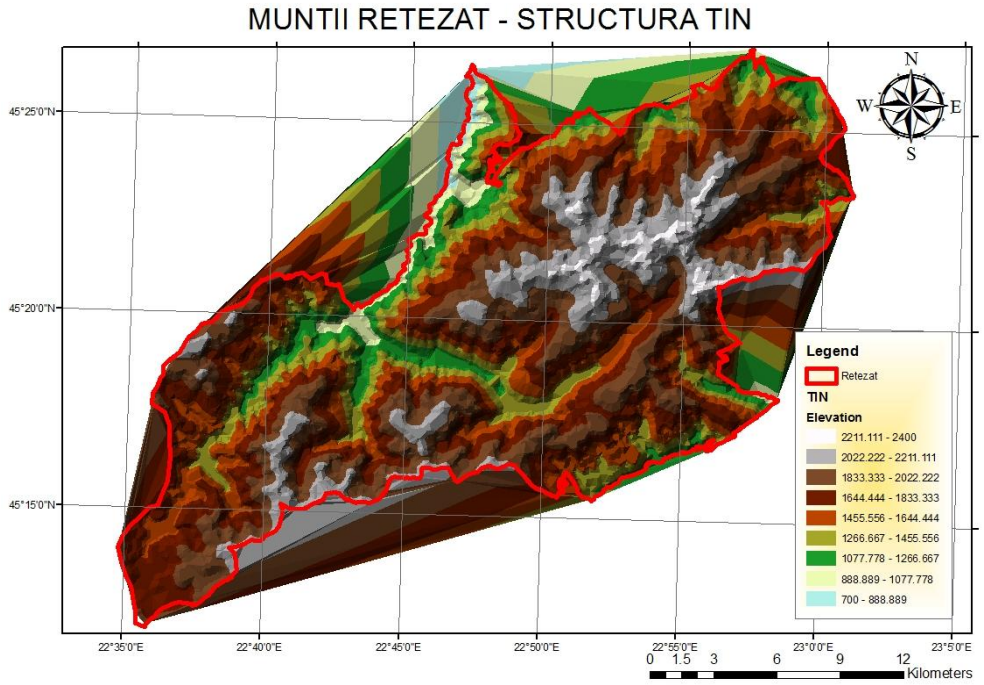

Fig. 5 TIN structure in Retezat Mountains

CONCLUSIONS

Among the areas where the digital terrain model can have immediate application include: analysis of telecommunication systems (with cross sections of land, spread analysis, transmission networks and other specific applications), designing pipeline networks (eg Connection to the water), command and control of various systems, and all other areas where it is necessary to know the altitude information at different points of a surface.

BIBLIOGRAPHY

1. DIMA, N., HERBEI, O., etc. - General topography and elements of mining topography, Universitas Publishing, Petrosani, 2005

2. MIHAI HERBEI, Geographic Information System, Universitas Publishing, Petrosani, 2013
3. IONESCU, I. - Engineering photogrammetry, Ed MatrixRom, Bucharest, 2004