THE APPLYING OF THE GOOGLE EARTH SIGHT MATERIAL WITH PURPOSE OF SPACE ARRANGEMENT OF THE TERITORY OF AN ADMINISTRATIVE UNITY

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Abstract: *in this work there are presented some results of the accuracy checking of relief representation on the posted materials on sight Google EARTH.*

The work is motivated by the collecting and examination of the cartography material being necessary for the locality GIS elaboration with didactic goals by the students.

Key words: *Geographical Information System, modeling, Google EARTH.*

Rezumat: *În lucrare sunt prezentate unele rezultate ale verificării preciziei de reprezentare a reliefului pe materialele postate pe situl Google EARTH.*

Lucrarea este argumentată prin necesitatea de colectare şi examinare a materialelor cartografice necesare elaborării GIS - ului localităţii în scopuri didactice de către studenţi.

Cuvinte cheie: *Sistem Informaţional Geografic, model, Google EARTH.*

The digital models integration of the lot in the geographical informatical systems (GIS) were suggested by B. Makaroic (1977); that were also a more detailed investigated subject by R. Adlor (1978). During 70 [th] years some activities have already divided into data bases for the digital models of the lot (A.A.Noma, 1974, I.R.Jancaitis, 1976, A.A.Elassal, 1978, A.A.Noma/N.Spencer, 1978) but it has existed a non correlation on the structure base for GIS.

An other trial was oriented at that time on the digital administration of cartographical data at the general model. Very soon the solving came from the GIS exterior by a interdisciplinary approach and then the most problems of GIS could be solved by the 2,5D structures that were anticipating the assimilation of the lot data.

For decades territorial (urban) planning was done by drawing plans and building elaborate models from wood and pasteboard. The modern 3D – computer simulation derived from informations of the digital map are revolutionning process.

3D visualizations give a better impression of the surrounding than 2D - maps and help pinpointing areas where something needs to be done.

The GIS diffusion in Moldavian Municipalities is increasing. In the most cases urban planning is the leading application but GIS is far from being an actual support in planning process. GIS is going include 3D tools that can well improve planning application.

The paper investigates haw territorial planning can use the existant materials that is important for the study process. The key idea is to use a lot the advantages of the 3D visualization.

3D manipulates planning offers many advantages to students such as:

- students get more involved in planning processes once they really see what is going to be drawing.
- planners like it because they can explain their ideas much more fully. They can speed up the planning process and are still able to test more variants.

At present the Geographical Information Systems are generally used for spatial information analysis but they can be also used for the projection works in the area of engineering arrangements, urbanism and the territory systematization, etc.

Many GIS - applications are based on cadastral information. Unfortunatelly to the cadastre elaboration in Moldova Republic the information about the relief is not included in data bases. Data-collection and its maintenance is a part of GIS-applications which is already solved in a lot of organizations.

The use of SIG with the purpose of the territory management became more and more spread last years.

Practically every territorial administrative unity must hold an integral base of geographic data about the territory that belongs to it being applied for the planning and motoring works but accounting the SIG potential to be adopted operatively the decisions. At present on evaluating the resources for the capitalization of the new technologies like the informational systems the main attention in the most of cases is attracted to the mode of data collection and their administration, but the quality aspect was shadowy remaining. By the quality of data is meant both their structure and make-up and their precision. This indicator will directly influence the final product. This aspect must be clarified still at the initial stage of the sources choosing from which the data will be corrected. The success of SIG applying will be influenced by the professional preparation of the specialists that obtain the first skills during the study years.

With the goal of the professional preparation of the future specialists the authors suggested themselves to do an investigation concerning the accuracy of the relief representation with help of the digital model. At present, applying the existent materials timely the students elaborate annul projects and graphical works at the studied subjects.

In the nearest future we intend to use this tindem to use our results for integrating diverse sources. The studies are at the initial stage being a domain that we wish to be possessed by the studious young people.

As reference point for studies effecting in this area were served:

- the fragment of digital model of the village Poganeşti from Moldova Republic elaborated on the basis of the elevations of 2006, took over the Google EARTH sight;
- the elaborated topographical plan on the scale 1:5 000 with the equidistance of the curves at the 2 m level;
- the recommended technical instructions.

The history of the evolution of the Poganeşti commune is very varied. It is placed in the centre of the Republic of Moldova at the latitude of 46°41'34"N and longitude 28° 13'59"E, the average well balanced altitude. The total surface of the locality constitutes 2042ha. A great part of this territory is covered by private gardens. The locality relief is very diversified where prevails a rugged territory submited to erosion phenomena. Up to this data areas have been surveyed mainly by employing photogrammetric thus achieving accuracy hardly ± 0,5 m.

The topographic quality depends of the precision of representation on the plan of the relief - scope, named and the precision of the altimetrical topographic base being characterized by the total error of quota determination of a point under the level curves outlined on the plan.

In the (fig. 1) is presented the image of Poganeşti locality with help of the EARTH Google sight.

Fig. 1 – The geographical emplacement of the Poganesti locality, district of Hinceşti.

According with the instructions in force the average error of rising of the relief in comparison with the geodesical network points must not surpass the size equal to:

- 1/4 from the equidistance of the level curves for the flat zones with slopes up to 2º;
- 1/3 from the equidistance of the level curves for the breaking down zones with slopes comprised between 2º and 6º for

the topographic plans with the scales 1:5 000 and 1:2 000, and for the plans with the scales 1:1 000 and 1:500 with slopes over 10º.

- 1/3 in case of the curves equidistance of level equal with 0,5 m – for the elaborated plans with the scales of 1:5 000 and 1:2 000.

On the lots with constructions the tolerance may be raised by 1,5 times.

For the crumbed zones with slopes greater than 6º - for the plan sat the scales of 1:5 000 and 1:200 and larger of 10º, for the plans at the scales of 1:1 000 and 1:500, the number of the level curves must correspond to the level difference, determined between the breaking up points of the slope but the average square error of characteristic points quotas of the relief has not to surpass 1/3 of the level curves equidistance.

The accuracy is not sufficient for increasing requirements of special applications on hydrology, forestry, agriculture not for designing urban settlements.

The average square error of the plan determination of the m_H point quota being between two neighbor level curves depends on:

- the square average error of plan position of the level curve m_h challenged by the levelment accuracy;

- the square average error of plan position of the m_c level curve challenged by the accuracy of the interpolation of the level curves (on drawing on the plan of the level curves by interpolating between the quoted points).

The general applied relation in this case is:

$$m_H = \pm\sqrt{m_h^2 + m_c^2}\,, \qquad (1)$$

or in Kopp opinion:

$$m_H = \pm\left(a + b \times tg\gamma\right), \qquad (2)$$

where: a – is the coefficient that characterizes the position error in the plan of the level curve due to the precision of the levelment;

b – the coefficient that characterizes the position error in the plan of the level curve due to the precision of the level curves interpolation;

y – the average angle of the lot inclination.

The graphic precision of the plans and maps depends on the scale. An error of 0,2 mm on a plan with the scale of 1:1 000 will mean a error in the lot of 0,20 m, while a plan with a scale of 1:10 000 will mean ten times larger, that is 2,00 m.

Fig. 2 – The locality lots submitted to the researches.

For determinating the quality of the posted material on the sight EARTH Google the authors applied different methods of positioning and determination of the points altitude from the topographic surface.

As it is seen in the (fig. 1) and

(fig. 2) the locality relief is comparatively broken. For these reasons it was decided that the study tube effectuated both on the broken lots and on the flat ones. During the investigations they were deposited 300 points. In the result of the measurements effectuation both on the sight material and on the topographic plan it was established that the error constitues on an average 2,25 m.

Taking into account the obtained result one can say that the set material on EARTH Google may be utilized in didactic goals, but in the future may appear the necessity of the raising at the higher level of the material quality.

Detailed investigation into the accuracy of this model depends on the lot slope resulted in standard deviations between ±0,5 m (flat lot) and ±0,5 m (lot with 70% slope).

The histogram shows that the residuals between control points and interpolated ground elevations are in good approximation gauss – distributed. The maximal residual reaches 3,5 m. This is equivalent to 2,5 times of the standard derivation of these residual series.

The accuracy has to depend on the main purpose connected with an efficient economic maintenance.

The quality of these 3D views is low, they are far from being realistic simulations. They are acceptable only if they are quickly and easily produced, if they are addressed to planners.

The three dimensional description of the terrestrial surface of settlements and methods to maintain, update and distribute these data are major tasks of the modern geographical data management.

Currently we a have not access to source data from aerial photogrammetric and terrestrial surveying.

The traditional maps are abstractizations of the real world, a sum of important elements sketched on the list of paper by symbols representing physical objects. People utilizing maps must interpret these symbols. The topographic maps show the lot form with help of the level curves. The teal form of the lot may be seen only with the mind eyes. The technics of graphic representation of the digital model of the lot make visible the relations between the map elements, increasing the skill of extracting and analyzing the informations.

Intended under a matrix form the digital model of the lot stocks the information of the elevation for a certain surface. The determinant for the information quality is the size of the grille (in vectorial mode) or the value of the pixel (in raster manner) at which it was achieved (the fineness with which was done the area division along the axis of X coordonation, respectively Y, corresponding to chosen geographical projection.

At the demand of a digital model it is being started from the digital map of the lot comprising the level curves and quoted points with the information of associated elevation, the rivers and the crest lines represented as 3D lines, the slope breaks as well as the rest elements that have an importance in the mathematic modeling of the lot.

Besides of the accounts made for the estimation of the space orientation of diverse zones of the studied surface one may generate the matrix of the digital model taking into account the chosen space intervals.

The digital model is a complex product that in the conditions of using a cartographic material of good quality has characteristics that for a specialist are equivalent with the utilization of the satellitary images and the stocked information in a digital model is more easily to be used.

Among the domains where the digital model of the lot may have an immediate applying one can enumerate: the analysis of the telecommunications systems (with the achieving of the lot profiles, the analysis of propagation, etc.), the projection in the domain of conduct networks (for example the water bringing) the command and control of the diverse systems, as well as in the all other areas where is necessary the knowledge of the altitude information in various points of a surface.

In the result of the effectuated investigations they were made the following conclusions:

1. The utilization of the geographical information set on the Earth Google sight is one of the future activity – the access, analysis and stock with help of the Internet;

2. The unknowledge of the materials may cause the loss of the resources and do the system inefficient irrealisable or that the taken decisions will become dangerous;

3. The determination of the accuracy must be put in discussion at the initial stage as it affects the cost, time and choice of collecting sources of the primary information included in the data bases.

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