MODERN TOPOGRAPHICAL METHODOLOGY EMPLOYED FOR THE IDENTIFICATION AND THE DETERMINATION OF LAWN SURFACE

METODOLOGII TOPOGRAFICE ACTUALE UTILIZATE PENTRU IDENTIFICAREA ŞI DETERMINAREA SUPRAFEȚELOR DE PAJIŞTI

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Abstract: *After the EU integration, the necessity of rural development appears, along with a new functional frame for agricultural and lawn terrain. The paper studies the influence and the topographic methods used in agriculture, for lawn implicitly, as a field for terrain inventory, necessary for rural development and not only. The paper has at its basis the knowing of topographic equipment and topographic survey methods for parcels. In addition, a description of methods used in data processing is present along with the field measuring data.*

Rezumat: *În urma aderării la Uniunea Europeană, a apărut necesitatea dezvoltării rurale şi totodată stabilirea unei noi încadrări în categorii funcționale a terenurilor agricole inclusiv al pajiştilor. În cadrul lucrării s-a studiat influența şi modul de aplicare a topografiei în domeniul agricol şi implicit al pajiştilor ca un domeniu de inventariere a terenurilor necesar pentru dezvoltarea zonelor rurale şi nu numai. Elaborarea lucrării are la bază cunoaşterea aparaturii topografice şi a metodelor de ridicare topografică a unor parcele sau porțiuni de teren. De asemenea, lucrarea prezintă o succintă descriere a metodelor de prelucrare a datelor obținute în teren.*

***Key words*:** GPS, *total station, cadastral work orthophotoplan, area calculation*
Cuvinte cheie: ***GPS,*** *stație totală, plan cadastral, ortofotoplan, calcul de suprafață*

INTRODUCTION

The land with its wealth is a fundamental economic value in satisfying elementary necessities; therewith these are the most significant part of national patrimony and a serious source of income at the state budget through taxes. Knowing quantitative and qualitative these assets or real estates, is the purpose of cadastre and topography. These works are done by inventory, land measurements and by drawing out plans and maps, the certain field situation of all assets. Considering these purposes, along with other specific disciplines, complex works regarding geo-topo-photogrammetric field of research, describing, classification and land evaluation are done.

The future expectations of topography, cadastre, and territory arrangement represent important tasks that need a more complex activity led and organized by well-trained specialists having high professional and scientific education.

The outcoming results, cadastral documentations, periodically updated, serve permanently to the Land Register where basic data along with tabular rights are written.

According to the actual land legislation, the Romanian territorial asset is made by all existing terrains, regardless the destination. They are holding on basis of propriety title being part of private or public assets.

Knowing the territorial assets as landholders, using categories and territorial administrative units, is made by specific cadastre works along the whole country territory.

In modern democracy, the basic cell of the society is represented by private property, as a result of hard and perseverant labour, where society members improved their life conditions.

The propriety right is very important not only for the holder but also for the whole

society. Considering this social function, it is logic and necessary that the holders of propriety right to be stimulate in a rational exploitation of his good by obtaining efficient economical achievements, preserving it carefully, and using it in his personal interest and in the interest of the community.

On this context, the paper presents the influence on which topography is involved in lawns and agricultural fields of activities.

MATERIALS AND METHOD

The paper purpose consists in showing modern methods of lawn parcelling and field identification along with a succinct surface computing methods.

In order to realize this steps, the topographer needs to have a solid material base, that include performing equipment which allows the operator access on various land shapes, having direct or less visibility, on high vegetation areas or large slopes.

In addition, one of the most important conditions is the necessary documentation for the interest areas consisting in cadastral plans, topographical and not al least orthophotoplans of areas where the work must be done.

Concerning the equipment tooled up this can be a GPS station as in figure 1.

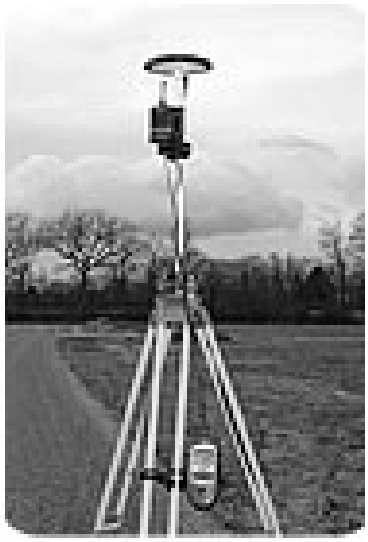


Figure 1. GPS station designed for topographic works

GPS techniques (Global Positioning System) represents the most recent way of measuring and processing data being extremely useful in geodesic and topographic network and also in cadastral works.

A GPS technique is based on a 24 satellite constellation moving around six knowing orbits around Earth at high altitude. The orbits altitude has such range that the interference with soil waves is avoided. The GPS has a high precision technology, which allows the operator to determine precisely the objects' position on the Earth.

The basic principles are very simple however; the system on its own is using high tech equipments. For better understanding the system, it is necessary to divide the system in 5 basic components as shown in figure 2.

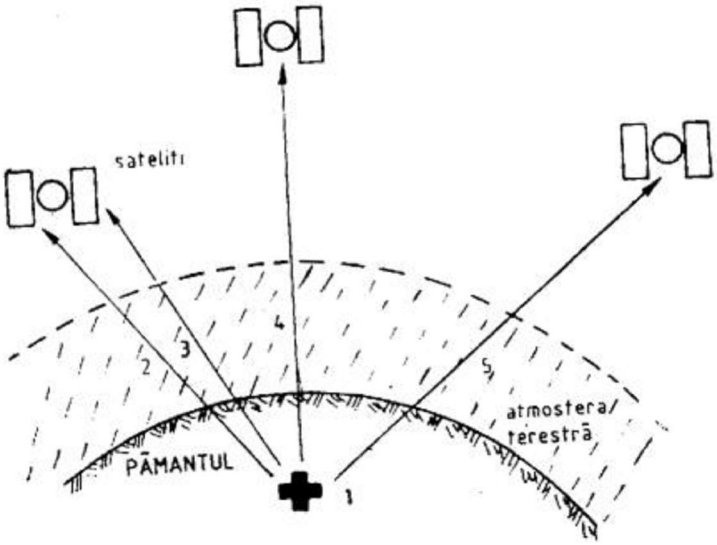


Figure 2. The GPS system components

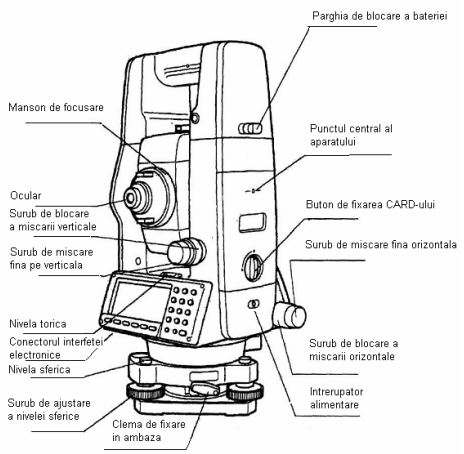
The first basic component is triangulation (GPS position through the help of satellites); the second component is distance measuring by considering the time during the radio wave is going through; a third component as the necessary high precision equipment for time measuring; a fourth component that is the precise satellite position and the last one being the information concerning the air layer that GPS signal is going through in order to compensate the errors produced by the atmosphere and ionosphere.

The basic of GPS system consist in using the satellites as references points in order to determine the triangulation the points' position on the Earth. These point positions will be determine considering the distances from the reference satellite, by multiplying the velocity and time. Because the light velocity is already known, the only component that we have to compute is the time interval that a signal needs to arrive at GPS antenna. Assuming that the satellite and the Earth receiver (antenna) use the same codes we can determine the time necessary by comparing the time difference between the two codes. Considering a maximum precision in synchronization between the satellite and Earth receiver, the precision range of time difference is the same. For obtaining an optimal precision determination, it is necessary to receive GPS signals from at least four satellites in the same time.

For small areas, where the visibility unto points of knowing coordinates from the geodesic network, to determine the lawns boundary, the total stations can be used successfully.

Practically today, this is the geodesic equipment used on a wide scale in the geodesic and topographic activities. Its evolution mainly concerning the electronic part lead to the name of total stations, because beside measuring the characteristic elements of a tachymeter, it offers a list of data processing and geodesic applications straight in the field with the possibility of data storage into internal memory.

For a proper use of the total station, a serious study of the user's manual is recommended. In this situation, only the basic principles will be presented, as general considerate for all available total stations. Entire equipment is made by the instrument itself, one or more prisms and tripod. The main components of a total station are presented in figure 3.



Picture 3. General description of a total station

For executing short distance measure that are not requesting a prior use of aperture glass fibre tapes and metal tapes along with laser beam distomates can be used (figure 4).

Figure 4. Instruments for measuring distances

Topographical survey includes the necessary operations to obtain on paper or topographical support the horizontal projection of land surface at a desired scale.

The planimetric survey can by made by several methods:

a) *Graphic methods* – These methods are realized are based in direct field determination the horizontal projection of the surface at a selected scale and finally obtaining the plan without subsequent calculus. The plan is obtained on basic measure but also expeditive approaches.

b) *Numerical methods* - These methods are based in determining the projection by using polar or rectangular coordinates. On this purpose the field measurements consist in angles and distances which define the points position, later on during the office operation the rectangular or polar coordinates are obtain. By using these coordinates, the plan is achieved. Using this method the plan precision is much higher.

The main numerical methods of planimetric survey are:

- Triangulation method; where points coordinate named as sustaining points are computed and joint together frame triangles. The plan metric point position is base on trigonometric solution of a triangle having a reduced field measure elements, later computed, and transformed in coordinated on based on the relation between triangle angles and sides.

- Poligonometry method; which is a method use to thick the sustaining points, by scanning a layout between the sustaining points and measures the (interior and exterior) angles, the layout details and lineament length.

- Traverse method; use as main method of detail survey consisting in measuring the horizontal distance and angles between successive polygonal lines made by conjunction of characteristic points which delimits the surface.

- The intersection method is the method where points position is achieve by sight intersection between the unknown point coordinate and points of knowing coordinate. Using these method the field operation are short as time, because only the angles are necessary to be measure

- The perpendiculars method or echeric coordinate method; this method is done by descending perpendiculars on a knowing line from prior measures, is use also for survey surfaces with large sinuosity.

Photogram metric methods – Are those methods which are use for making plans and maps, special photos of land make from airplanes and named photogram. The method is recommended for large surfaces and scale between 1:100 and 1:100.000, but mostly for 1:2000 and 1:25000.

Combined methods – Are mostly designate for photogram metric survey (photo plans, that means only plan metric), which later on are completed with survey using other topographic methods.

RESULTS AND DISCUSSION

The field data processing will be used to finalize a cadastral documentation representing the finality of topographical activities. The stored data into the internal memory of total stations will be transferred into computer memory by using the adequate software of the total station.

To achieve the situation plans the data transferred into the computer memory will be processed by computerized software such AUTOCAD.

On the first stage the situation plan will be realized by using the polyline base on the boundary points coordinate and area (figure 5), having different shapes according to the land shape. Subsequently, these boundary will be overexposed on the ortophotoplan of the effectuate area for verification (figure 6 sample).

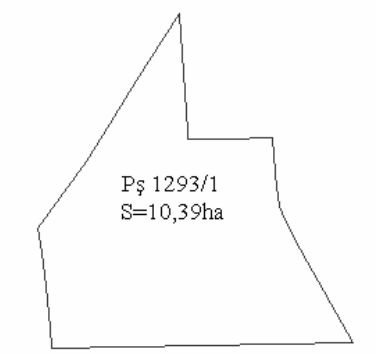


Figure 5. The boundary plan of parcel

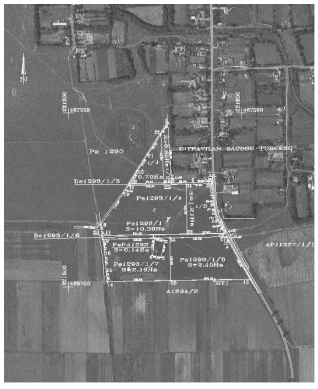


Figure 6. Overexposing on the ortophotoplan

CONCLUSIONS

Considering the aspects from the paper, some advantages of using high technologies on agricultural field and not only can by drawn out.

Today, the tridimensional determination means an essential desiderate in engineering topography applied in industry. The three points coordinate, obtained as solitary solution, the unitary way of treating planimetry, the way of unitary treating for planimetry and altimetry suppose to use specific methods which include all kind of angular and linear observations.

The final goal consists in defining the characteristic point for a object in order to define its shape. Whether the contact determination methods are in a wide variety, they are base on natural and elementary knowledge of optical and geometry.

On the same time, using these methods is related with the high precision demands for the whole scale of existing measuring systems and a complex apparatus.

In any topo-cadastral work, the essential element is the sustaining network, which is the starting point of the work.

The following were defined:

- Possibilities of making the measurements, instruments choose, number of necessary observation, the fields measurement;
- Methods of data processing.

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