POSSIBILITY OF SOLVING PROBLEMS IN CADASTRE

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ABSTRACT: *It presents the possibility of replacing topographic methods analytical methods detaching the surfaces made of cadastre issues.*

1.THE PURPOSE AND IMPORTANCE OF THE WORK

Preparing technical documentation that is required for the legal classification of a building can be done using measurements and processing methods specific to the cadastre. Complex issues in this area include among others works on dividing surfaces and their calculation.

Solving the many situations encountered in practice is possible using appropriate calculation methods, but with regard to finally obtain the appropriate size in terms of quality, high precision, respectively.

Following the paper uses analytical methods of calculation in place for situations commonly encountered topographic methods.

2.CONTENTS OF THE WORK

It will be analyzed two cases of division of areas:

- dividing of a surface into a triangle:

a) after passing the right through a point of the triangle
b) after a parallel to a side of the triangle
c) after a same polygonal contour from another polygonal

- dividing of a surface into a triangle by a line passing through a point of the triangle We consider the surface S bounded by the sides of a triangle (fig.1), peak points (P_1, P_2, P_3) having the known coordinates.

S_1 and S_2 = S – S_1, after passing right through the deck P_2.

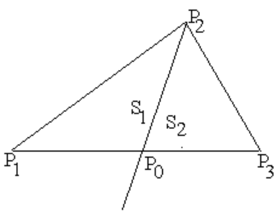

Fig. 1

Splitting problem is to determine the coordinates of P_0 which shall be delimited the surfaces S_1 si S_2.

For the surfaces S_1 and S_2 equations can be written:

$$x_0(y_1-y_2)+x_1(y_2-y_0)+x_2(y_0-y_1)=2S_1$$
$$x_0(y_2-y_3)+x_2(y_3-y_0)+x_3(y_0-y_2)=2S_2 \quad (1)$$

Or:

$$x_0(y_1-y_2)+y_0(x_2-x_1)+x_1y_2-x_2y_1=2S_1$$
$$x_0(y_2-y_3)+y_0(x_3-x_2)+x_2y_3-x_3y_2=2S_2 \quad (2)$$

By solving the system of equations is obtained:

$$x_0=\frac{\begin{vmatrix}x_2y_1+x_1y_2+2S_1 & x_2-x_1\\ x_3y_2-x_2y_3+2S_2 & x_3-x_2\end{vmatrix}}{\begin{vmatrix}y_1-y_2 & x_2-x_1\\ y_2-y_3 & x_3-x_2\end{vmatrix}}$$
$$y_0=\frac{\begin{vmatrix}y_1-y_2 & x_2y_1-x_1y_2+2S_1\\ y_2-y_3 & x_3y_2-x_2y_3+2S_2\end{vmatrix}}{\begin{vmatrix}y_1-y_2 & x_2-x_1\\ y_2-y_3 & x_3-x_2\end{vmatrix}} \quad (3)$$

By conducting relations from (3) we obtain:

$$x_0=x_2+\frac{S_1}{S}(x_3-x_2)+\frac{S_2}{S}(x_1-x_2) \quad (4)$$
$$y_0=y_2+\frac{S_1}{S}(y_3-y_2)+\frac{S_2}{S}(y_1-y_2)$$

b) Splitting of a surface in a right triangle after a parallel to a side of the triangle

We consider the triangle $P_1P_2P_3$ (fig.2), for the coordinates of the peak are known.

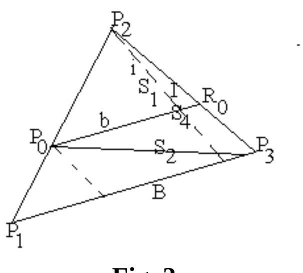

Fig. 2

In this triangle should be separated surfaceS_2 (known) by right P_0R_0 parallel to the side P_1P_3.

To solve this problem is reduced to determining the coordinates (x_0y_0) the point P_0.

If the point P_3 goes a line that passes through the point P_0 then the problem is reduced to the previous case

The coordinates x_0, y_0 the relationships are obtained:

$$x_0 = x_3 + \frac{S_3}{S}(x_2 - x_3) + \frac{S_4}{S}(x_1 - x_3) \tag{5}$$
$$y_0 = y_3 + \frac{S_3}{S}(y_2 - y_3) + \frac{S_4}{S}(y_1 - y_3)$$

In relations (5) are known:

- coordinates: x_1, x_2, x_3 and y_1, y_2, y_3

surface S of coordinates using the equation:

$$2S = x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) \tag{6}$$

In relations (5) are not known the surfaces S_3, S_4.

To determine these areas proceed as follows:

With the relations from figure 2 we have:

$$2S = BI$$
$$2S_1 = bi \tag{7}$$
$$2S_2 = (B + b)(I - i) = BI + bI - iB - ib$$

Or:

$$2S_2 = 2S + bI - Bi - 2S_1$$
$$2S_2 = 2S_2 + bI - Bi \tag{8}$$

And

$$bI = Bi; \quad i = \frac{b}{B}I \tag{9}$$

But:

$$\frac{bi}{BI} = \frac{S_1}{S} \quad \text{where:} \quad i = \frac{b}{B}\frac{S_1}{S}I \tag{10}$$

from the relations (9) and (10) rezults:

$$\frac{b}{B}I = \frac{B}{b}\frac{S_1}{S}I$$

where:

$$\frac{b}{B} = \sqrt{\frac{S_1}{S}}$$

And:

$$i = I\sqrt{\frac{S_1}{S}} \tag{11}$$

Wich:

$$I - i = \left(1 - \sqrt{\frac{S_1}{S}}\right)I \tag{12}$$

With the the relationship (12) is calculated: S_3

And with it:

$$S_4 = S - S_3 \tag{13}$$

c) Dividing by a polygonal contour surface parallel to other polygonal contour.

We recognize polygonal P_1, P_2, P_3, P_4, P_5 points whose coordinates x, y known(fig.3).

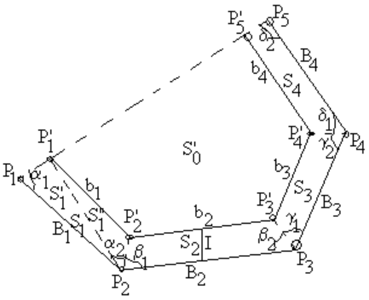

Fig. 3

Inside this contour surface S must separate an area S^0 delimited by the path P_1', P_2',…,P_5'.

Therefore, the surface "S" is known (is calculated from coordinates), and the surface "S_0" given, indicating that $S_0 < S$.

The problem is considered solved if the coordinates are obtained x_1', $y_1'$from the point P_1'.

Is this possible if I write equations corresponding surfaces S_1 si S_0' bounded by points $P_1P_1'P_2$ and $P_1'P_5P_4P_3P_2$.

$$x_1'(y_2 - y_1) + x_2(y_1 - y_1') + x_1(y_1' - y_2) = S_1' \tag{14}$$
$$x_1'(y_5 - y_2) + x_5(y_4 - y_1') + x_4(y_3 - y_5) + x_3(y_2 - y_4)$$
$$+ x_2(y_1' - y_3) = S_0'$$

Equations (14) form a system of two equations with two unknowns (x_1', y_1') which are obtained by solving the point coordinates P_1'.

It is specified that the surface S_1' we obtain the relationship:

$$2S_1' = B_1 I \tag{15}$$

and $S_0'$with the relationship:

$$S_0' = S - S_1' \tag{16}$$

To obtain the height "I" we write:

$$(B_1 + b_1) + (B_2 + b_2) + (B_3 + b_3) + (B_4 + b_4) = 2S_0$$

Or:

$$I([B]+[b])=2S_0$$

But:

$$b_1=B_1-(ctg\alpha_1+ctg\alpha_2)I$$
$$b_2=B_2-(ctg\beta_1+ctg\beta_2)I$$
$$b_3=B_3-(ctg\gamma_1+ctg\gamma_2)I$$
$$b_4=B_4-(ctg\delta_1+ctg\delta_2)I$$

And

$$[b]=[B]-[ctg\ i]I \qquad i\longrightarrow \alpha,\beta,\gamma,\delta \qquad (18)$$

With the the relationship (18) is calculated (17):

$$(2[B]-[ctg\ i]I)I=2S_0$$

Or:

$$[ctg\ i]I^2-2[B]I-2S_0=0 \qquad (19)$$

from the relation (9) rezults:

$$I=\frac{[B]-\sqrt{[B]^2-2[ctg\ i]S_0}}{[ctg\ i]} \quad \text{for } S_0<S$$

3.CONCLUSIONS:

Division's problems on surfaces are known primarily solved by trigonometric.

The methods presented above are analytical measurements used the known coordinates and surfaces calculated or data.

Even if the volume of computation is in some cases increased, the proposed methods provide superior accuracy in delimiting surfaces.

Delimitation to be separate surfaces is done by points that may appear in the inventory of known points.

Cases analyzed, shows a unified solution, from simple to complex and frequently met cadastre.

REFERENCES

[1].Leu I.N., s.a., *Topography and agricultural cadastre*, Didactic and Pedagogic Bucharest, 1999

[2].Veres I., s.a., *General topography and mining surveying elements*, Publishing House Universitas, Petrosani, 2006