MECHANICAL TRANSMISSION ELEMENTS JUNCTION TOPOGRAPHICAL PUT ON A VERTICAL, THROUGH DISTANCE MEASURED

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Abstract

The question of the transmission system reference topographic surface in a mine underground is critical to achieving the objectives appropriate action. They are known and applied techniques and methods of transmission using the sizes measured angles and distances. It is estimated that using just the sizes measured distances, reference solve underground transmission system, gives topographical elements with higher precision.

Keywords: topographic measurements, mining surveying, topographic underground networks, distances.

In practice different methods are known and applied Junction topographic elements such as: radial, triangle linking, forced alignment, intersections, etc.

The goal is to translate the topographic (coordinate, orientation) near the pit area, and remained in the ramp of pit (underground) (fig.1).

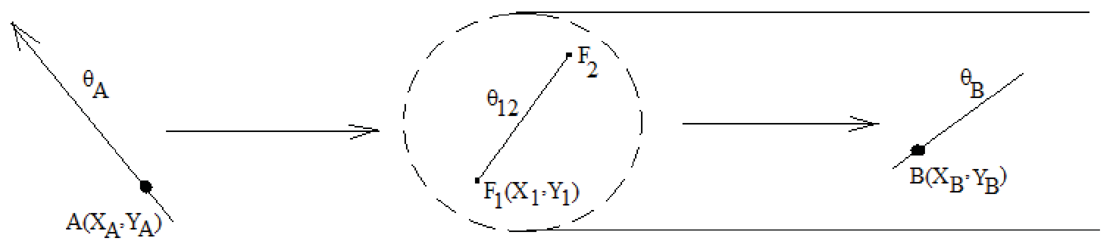

Fig. 1

So then , on the surface , are known :

x_A, y_A and θ_A

The cause:

a) x_1, y_1 and θ_{12}

b) x_B, y_B and θ_B

The methods known for the translation of the topographical elements (land, mineral) use the angles and distances sizes measured or calculated, without a rigorous processing in advance.

On the other hand, the measured angles that result from the measured directions have large errors because of their small lengths.

Anyway, it can be done at a quadrilateral area (fig. 2) (linking) defined by topographical elements.

Data:

- coordinates x_1, y_1 point of P_1;
- orient θ_{10} of the direction P_1P_0;
- quadrilateral sides α_0, measured.

The measured lines can be taken using the theory of smaller squares, writing:

$$(\alpha)+(\beta)-(\gamma)=0 \quad (1)$$

It is recognized the point P_2 fixed, those determined by using a high-precision radiation α_0 sizes and distances P_1P_2 series of measurements obtained directly from.

Or:

$$\alpha + v_\alpha + \beta + v_\beta - \gamma - v_\gamma = 0 \quad (2)$$

The angles α, β and δ are obtained from the edge triangles I, II and III with the general relationship:

$$tg\frac{x}{2} = \sqrt{\frac{(p-b)(p-c)}{p(p-a)}} \text{ for the triangle I, etc. } (3)$$

$$p = \frac{a+b+c}{2}$$

ω being α, β or δ.

And then:

$$v_\alpha + v_\beta - v_\gamma + \omega = 0 \quad (4)$$

$$\omega = \alpha + \beta - \gamma$$

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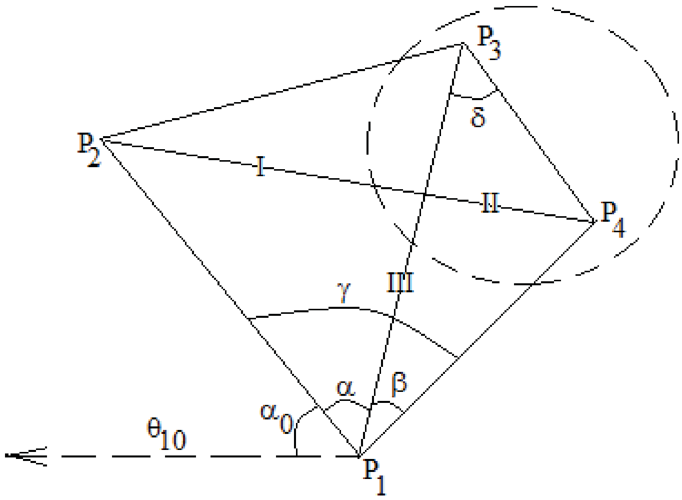

Fig. 2

The corrections v_α, v_β and v_γ are obtained with the relationships:

$$
\begin{aligned}
v''_\alpha &= (A_1 v_{23} + B_1 v_{13} + C_1 v_{12})\rho'' \\
v''_\beta &= (A_2 v_{34} + B_2 v_{14} + C_2 v_{13})\rho'' \qquad (5) \\
v''_\gamma &= (A_3 v_{24} + B_3 v_{14} + C_3 v_{12})\rho''
\end{aligned}
$$

Introducing in relation (4) results:

$$
\begin{aligned}
&(C_1 - C_3)v_{12} + A_1 v_{23} + A_2 v_{34} + (B_2 - B_3)v_{14} + \\
&+ (B_1 + C_2)v_{13} + A_3 v_{24} + \frac{\omega''}{\rho''} = 0 \qquad (6)
\end{aligned}
$$

Correction coefficients are obtained with normal relations:

$$
\begin{aligned}
A &= \frac{\sin\alpha}{4}\left(\frac{1}{p-b} + \frac{1}{p-c} - \frac{1}{p} + \frac{1}{p-a}\right) \\
B &= \frac{\sin\beta}{4}\left(-\frac{1}{p-b} + \frac{1}{p-c} - \frac{1}{p} - \frac{1}{p-a}\right) \qquad (7) \\
C &= \frac{\sin\gamma}{4}\left(\frac{1}{p-b} - \frac{1}{p-c} - \frac{1}{p} - \frac{1}{p-a}\right)
\end{aligned}
$$

With parameters 1, 2 and 3 corresponding to the triangles I, II and III, equation (6) has the form:

$$[av] + \omega_0 = 0 \qquad (8)$$

Correspondent to the normal equation:

$$[aa]k + \omega_0 = 0 \qquad (9)$$

Resolving it results:

$$k = -\frac{\omega_0}{[aa]} \qquad (10)$$

While:

$$
\begin{aligned}
v_{12} &= \rho''(C_1 - C_3)k \\
v_{23} &= \rho'' A_1 k \qquad (11) \\
&\ldots\ldots\ldots\ldots\ldots \\
v_{24} &= \rho'' A_3 k
\end{aligned}
$$

The estimated values of the sides are obtained from the corrected measures, corrections resulted from equation (11). For example:

$$
\begin{aligned}
(P_1P_2) &= P_1P_2 + v_{12} \\
(P_2P_3) &= P_2P_3 + v_{23} \\
&\ldots\ldots\ldots\ldots\ldots\ldots\ldots
\end{aligned}
$$

In the last stage, using the estimated values of the sides we calculate the angles α, γ and the survey elements from the clear area of the shaft.

$$
\begin{aligned}
x_3 &= x_1 + (P_1P_3)\cos(\theta_{10} + \alpha_0 + \alpha) \\
y_3 &= x_1 + (P_1P_3)\sin(\theta_{10} + \alpha_0 + \alpha) \\
\theta_{34} &= \theta_{10} + \alpha_0 + \alpha - \delta \pm 200
\end{aligned}
$$

For underground method applies similar.

Conclusions

The method of presentation contains a rigorous process of processing of the measured measurements.

Taking measurements are easy operations.

The measurements are determined more precisely, and the precisions can be assessed. The calculus volume does not constitute a disadvantage by using current techniques.

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