DETERMINATION OF THE STATION BY THE INVERSE CENTER OF GRAVITY METHOD

by

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When calculating the cartesian co-ordinates of a point by the subtended angle method, it is usual, after having selected a proximate station point M. to replace by straight lines round about that point, all the subtended angles obtained in combining two by two the readings corresponding to the sights of the points known. Position M of the station is then selected inside the polygon so formed and the orientation of zero of this station is determined by an average of the differences of orientation, starting from this point, of the various sighted points and their readings.

If the number of known points which have been sighted is fairly large, a calculation of the position and orientation of zero may take a long time.

A. COURTIER shows that the same result is just as accurately obtained with a polygon of many less sides, by using a point which he calls "*inverse center of gravity*" and of which he gives the following definitions : A, B, C..... being the points sighted, their inverses a, b, c, are determined in relation to point M by the formula :

$$\overline{M_0 a} = \frac{1}{\overline{M_0 A} \sin 1''},$$

the centers of gravity g of points a, b, c are then determined by

$$x_g = \frac{\Sigma x_a}{n}, \qquad y_g = \frac{\Sigma y_a}{n},$$

and lastly point G_0 on straight line $M_0 g$, such as

$$\overline{M_0 G_0} = \frac{1}{\overline{M_0 g} \sin 1''}.$$

This point G_0 has interesting properties.

The point looked for M is to be found on a circle passing by point G_0 and points such as A and subtending angle $\widehat{AM_0 G_0} - \varepsilon_A$.

ε being a quantity which is easily calculated by means of the readings and of the known positions.

By replacing each of these subtended angles by a straight line in the vicinity of point Mo, it will be possible to select the position of point M and then to obtain the orientation of the station zero in relation to this point, through a calculation which will be all the more simple as part of its data can be taken from the graph.

The simplifications proposed by A. COURTIER besides being ingenious, mean a considerable saving of time and whilst being in agreement with the errors' least square theory, allow a more rational use of all the sights.

P. V.