INFORMATICS INTERPRETATION OF THE VISIBILITY BETWEEN TWO GEODESIC POINTS

Ioan Ienciu

ABSTRACT.When solving geodesic problems, informatics is the support for a fast and precise determination of geodesic networks, namely of the visibility between points, for the optimal form of geodesic networks triangles as well as for a substantial economy of time and money.

The informatics solution of the visibility between two points uses the concept of "visibility rectangle", meaning a mathematical solution put into an informatics support of the problem "when does a point belong to the visibility rectangle?". This problem will be solved by comparing the surfaces of the visibility rectangle to the sum of surfaces formed by a point with the sides of this rectangle.

1.Introduction

In sight of drawing up a topographic plan it needs the determination of a sufficient number of points which, through their pozition on the plan against a certain reference system, rendering the plane image of the ground. The inspection points of the reference system can be situate at excess length against the land who size, form and surface we want to determinate and for this reason we must to position new points for the geodetic support network.

2. Tehnical Conditions

The projection of new points of the geodetic network is directed to:

- the points need to cover entire zone when it follows to achieve the geodetic triangulation network, and its must to correspond the order IV or V, thinking of the distances between these points;

- achieving geometric simple forms where the triangles don't have angles with small size then 30g;

- the points can be plant easy in grounds;

- the possibility of quick access to points;

- existing the visibility between points in both directions.

Last condition assumes another travelling on ground to can determinate the visibility between two geodetic points, determination who requires a big consumption of material funds and human.

This travelling may be remove using a macrolanguage to define a function of a visibility between two geodetic points who can achieve easily using as a source datas the graphics coordinates. Like a programming language it was chosing the Visual Basic which puts at command designer of applications a concourse a visual elements which standards define a graphic interface.

3. Informatics Interpretation of the Problem

At the beginning I shall define a concept concerning the rectangle of visibility. Through rectangle of visibility format of the points p_1 and p_2 we understand the rectangle who contains between his small sides, with length until $10m$, these two points, and the big sides are taking by the average of superior and inferior limit for each order of triangulation network, average called diameter. This is calculating with the follow relationship:
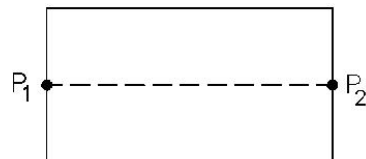
$$\text{Diameter} = (lim_{sup} + lim_{inf})/2.$$

Figure 1: Visibility rectangle

Using these conditions, the define function returns True if the two points p1 and p2 using as parameters "are seeing" (there isn't another points from grid which obturate them) and he returns False, otherwise. The algorithm in abstract code, on the strength of whom it implemented this function is next:

Algorithm visibility (p_1, p_2: Point) is:

Source datas: p_1, p_2: Point;
Visibility: = True; * is presupposed that these two points are seeing*/.
For i: = 1 to ngrid executes /* ngrid represents the number of points from initially grid and it is global variable*
* if the current point from grid i is found out in the rectangle of visibility then
visibility: = True.
* if the current point is obtureating the visibility then
visibility: = False;

4.Solving the Problem

To resolve these two logical functions:
* if the current point from grid i is found out in the "visibility rectangle" and
* if the current point is obturating the visibility
it established next:

At the beginning is establishing if a certain point from initially grid, where the point "i" is found out in this established rectangle, and he can obturate the visibility among the points p_1 and p_2.

A certain point "i" of initially grid is placed inside the rectangle of visibility if it carries out the condition as the the sum of the areas of the resulting triangles between this point and each side of the rectangle must be less or coequal with the area of the rectangle. In this case which points that verifies this condition shall be past in a new grid which we will work in the next phase.

At the second phase, all the points "i" which verifies the condition of placed inside the "visibility rectangle" will be submissive the next test, respectively it will check up if it obturates or not the visibility between p_1 and p_2.

The point "i" obturates the visibility among p1 and p2 if the height of the point (Z_i) is elder than the height of the point resulting at the intersection between the perpendicular from the point "i" and the line generated from the points p_1 and p_2.
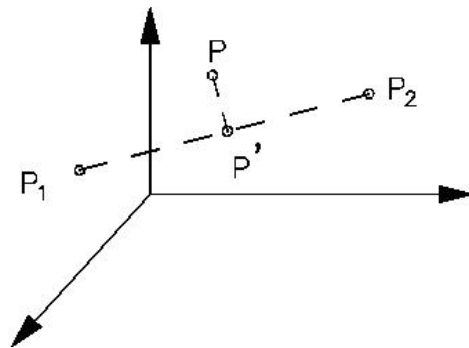

Figure 2: Visibility between two geodetic points

The calculus of surfaces was making using the Heron formula for which the lengths of sides were calculating initial from the planes coordinates of these points and which were comparing with the calculating surface for rectangle.

5. Conclusions

Considering that the apparatus using to crunch the geodetic network, indifferent from them type (GPS, total stations with angular precision or theodolites with high precisions), are using, like a principle from determinate the points, the triangle relationships concerning at angles, sides or both of them, it's strongly recommended to respect the tehnical conditions to realise the geodesic network.

Using this informatic application which has on base the tehnical conditions to determine a new geodesic point, it can be determinate the best position to him through the study of the map and after this through the recognize of the land in sight of plant the point in ground. This operation will not call for recurrence visite on the land neither the employment of speciality apparatus to verify the visibility between the geodesic network point, inter alia using a simple operation at the office we can significant reduce the

cost of the land operations and the allocated time of a work from new points geodesic determination.

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Author:

Ioan Ienciu
"1 Decembrie 1918" University of Alba Iulia,
str. N. Iorga, No. 11-13, 510009, Alba,
Romania,
e-mail: iienciu@uab.ro