DOI: 10.29302/Pangeea 19.14

PROXIMITY ANALYSIS BASED ON THE INTERACTION OF GPS STATIONARY POINTS WITH ADJOINING OBSTRUCTIONS

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ABSTRACT: *The approached subject is about the problem of satellite geodesy being related to the establishment of some modalities that can provide accuracy in obtaining higher precision through a careful planning and organization of GPS observations. That is to say, correct information that comes at the right time can lead to the expected result. Not a few times it has been shown that improvisation, even if it represents a level of creativity, relying on intuition, it is dangerous in the engineering activity in general, and in topo-geodesic works in particular. Therefore, a set of rules is required, which even if at first it seems unimportant, it will prove useful both for promptness and especially for obtaining the expected result.*

Keywords*: GIS; GPS Satellite Signals; Mission Planning; Analysis, Proximity;*

Introduction

Traditionally, during the planning phase of observations, and more precisely, when recognizing the land, it is necessariliy for the stations to be visited, for each point that will be stationed, before the actual measurement project begins. It is compulsory to have a field recognition and a thorough analysis of the obstruction diagram. The optimum period for measurements in each station is determined by studying the satellite constellation defined by the window in which the number of the visible satellites is maximum and by their geometry. The number of satellites visible at any hour of the day can be tracked on the graph.

The classic way of drawing sketches with the positioning of obstructions near the stations

The GDOP coefficient may lead us to the conclusion that its maximum value reduces the possibilities of satellite visibility, implicitly of the observations from that place (fig. 1,2).

Within the measurements, the zenith angles will be measured, from which the vertical angles will be deduced, and their value will be marked in an obstruction table (fig. 3).

Preparatory operations as a step before data integration

A preliminary stage of data integration with consistency on subsequent analyzes involves:

- analyzing the existing cartographic material;
- drawing the outline of the constructions;
- determining the positions of the stationary points (the centers of the channel covers);
- carrying out the proximity analysis between the stationed points and the facades of the related constructions in order to determine the distances between them (fig. 4).

In the field the values of the coordinates of the selected points are verified and the heights of the constructions are determined (fig. 5).

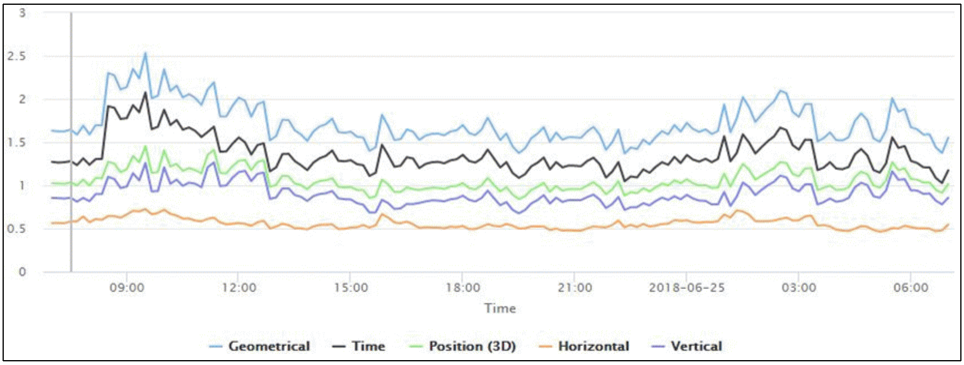

Fig. 1. The value of the GDOP coefficients

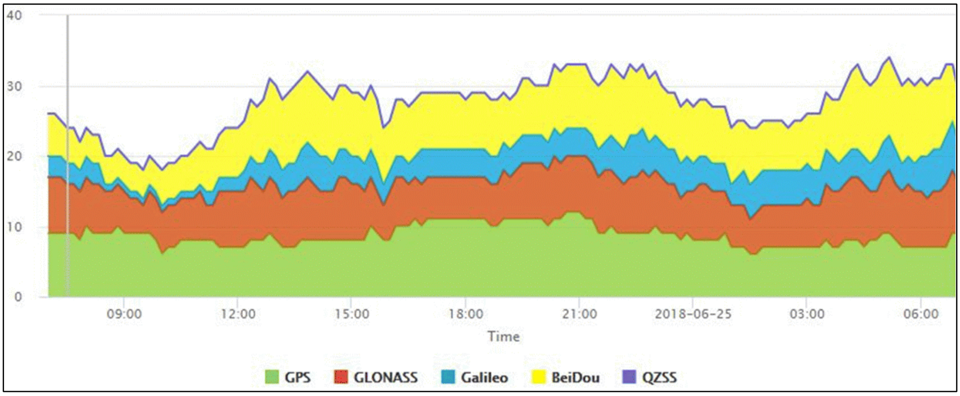

Fig. 2. The number of visible satellites

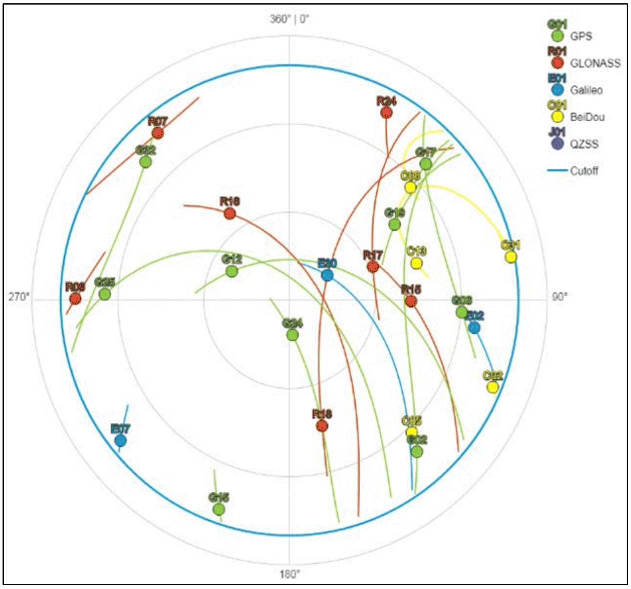

Fig. 3. The outline of obstructions

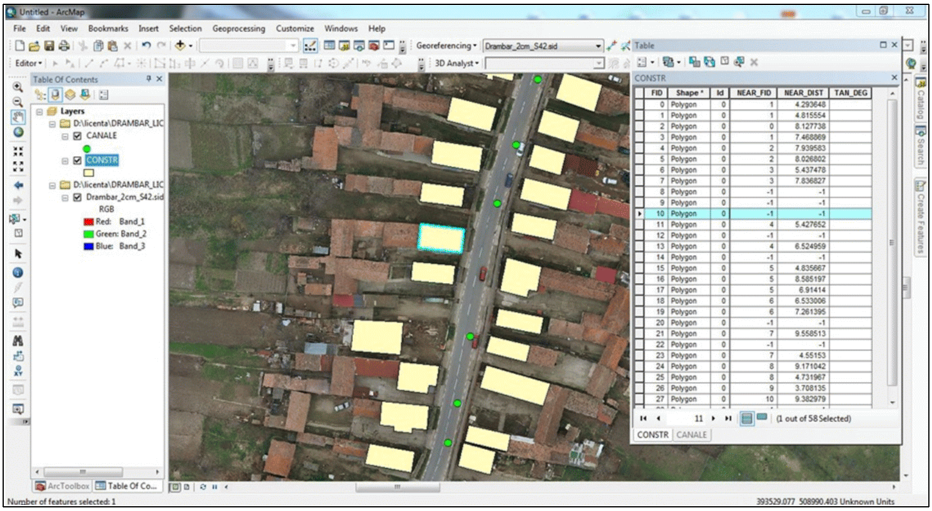

Fig. 4. Creating the contour of constructions and determining stationary points (center of channel covers)

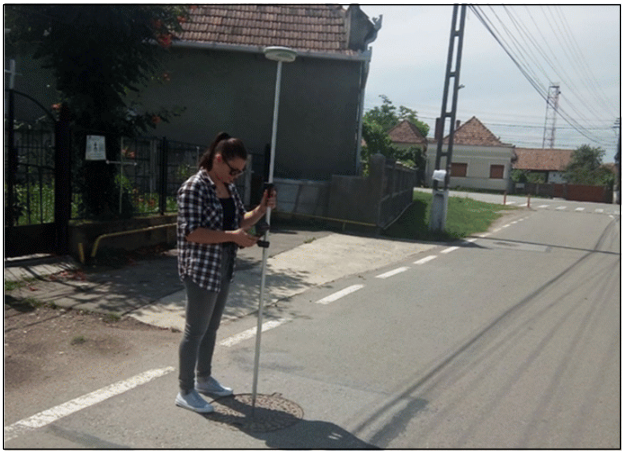

Fig. 5. Making GPS observations

Results and discussions

After obtaining the distances through the table computing protocol, these values are related to the tuples corresponding to the two layers (stationary points and constructions as a whole), respecting the cardinality (one to one). By means of design it was imposed the creation of a value field that will define the population with values representing the height of the constructions, thus, based on the two primary values (distances and heights of the constructions), new indicators will be determined that will mark values of the tangent of the resulting angle. The inverse of the tangent will be determined in radians, which will result in a sexagesimal conversion (fig. 6). For the transformation into radians we will use the following formulas:

$$1 =(2\cdot\pi)/400°[rad]=\pi/200°[rad]=1/57°.3[rad]$$

$$1'=(2\cdot\pi)/(400°\cdot 60)[rad]=\pi/(200°\cdot 60)[rad]=1/3438'[rad]$$

$$1''=(2\cdot\pi)/(400°\cdot 60\cdot 60)[rad]=\pi/(200°\cdot 60\cdot 60)[rad]=1/20625''[rad]$$

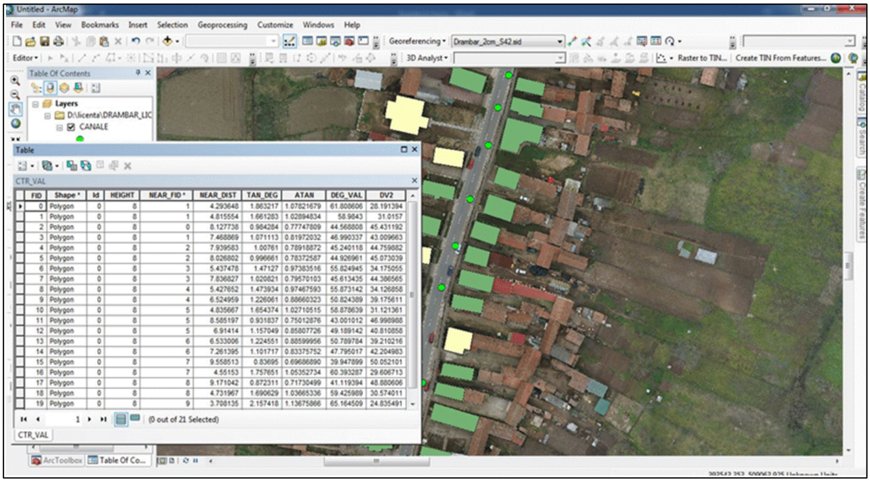

Fig. 6. Determination of the angular values in relation to the elevation mask

Next, those sets that exceed the value of 55º will be canceled, this operation impacting on the retention of the points having a value less than or equal to the specified threshold (fig. 7).

In addition to the classical data types used in computer systems, geospatial data has grown in recent years. Through the analysis tools that highlight the proximity, the distances between certain phenomena or objects are evaluated. These tools can identify features that are closest to one another or they can calculate distances between or around them.

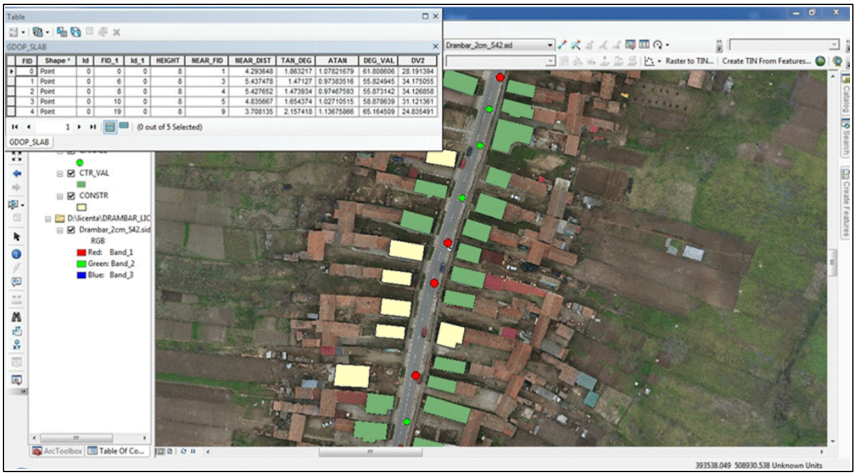

Fig.7 Determining the vulnerable points

Conclusions

In competitive societies, information systems for organizing data and information become essential in decision-making processes and in the framing of development strategies.

Thus, the planning of the observations starts with the drafting of the observation project, which is made on the basis of special programs that record the points of the network with approximate coordinates and then the horizontal obstruction drawings are drawn up, in this case above 10 ° elevation.

All these analyses that can optimize the planning and organization of the GPS instrumentation work have been carried out in the GIS environment, an environment aimed at the assembly of equipment, programs, methods and norms, aimed at capturing, storing, verifying, integrating, analyzing and visualizing the geographical data.

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