THE PERFORMING OF THE CIVIL ENGINEERING AND BUILDING SERVICES FACULTY'S TOPOGRAPHIC NETWORK AND THE INVENTORY OF ITS SPATIAL CO-ORDINATES

Daniel LEPĂDATU[1], Daniel COVATARIU [1], Gabriel SĂNDULACHE[2], Ana-Raluca ROŞU[1]

e-mail: daniel.lepadatu@gmail.com

Abstract

This paper describes a methodology to perform the local proper network of supporting points in order to be used in practical applications of Surveying discipline.
The usefulness of these points is obvious by the fact that it involves greater responsibility in addressing land measurement techniques and puts the students in a real situation with the opportunity at any time to verify the measurement's results. Also topographic points will be used as benchmarks to in-time monitoring of the buildings behavior surrounding the Faculty of Civil Engineering and Building Services.
In order to determine the coordinates of the new points was used GNSS Permanent Stations National Network using RTK method: RTCM (Radio Technical Commission for Maritime Services). Measurements were performed with GPS SOUTH S82T, whose field book has implemented software transcomputation real-time geographic coordinates obtained in STEREO-70 coordinate system. Network of permanent GNSS stations has used fixed station IASI_2.3 and virtual station RO_MAC_3.1_GG. Solutions for new points determinated were fixed, the determination's accuracy beeing ranged from 0.034-0.010 meters.

Key words: locating network, Global Positioning System – GPS, spatial coordinates

Seeting-up a topographic reference network in order to increase the efficiency of the students classes is a necessity to develop the quality of learning which will substantially contribute to the understanding of the utility of the Surveying discipline which was considered (until recently) less important by all stakeholders in the educational process. Taking into account the signals received from employers which understands the importance of specific knowledge it is considered to be vital the approaching of the studied cases in order to be near the real problems from the sites where the future engineer is often put in difficulty. Thi sit happen because he lacked the responsibility of working with the real values of coordinate's points from different applications and almost impossible to verify the final results with values of existing points.

Also topographic points will be used as benchmarks to in-time monitoring of the buildings behavior surrounding the Faculty of Civil Engineering and Building Services.

MATERIAL AND METHOD

In order to create a reference network of four points arranged in our Faculty's area (*Figure 1*), points that were prepared (*Figure 2*) and then placed (*Figure 3*) with the active participation of our students during practical classes. The landmarks was cast from reinforced concrete and having a truncated pyramid shape with 0.20 m base, 0.15 m small base length and 0.50 m in height. The supports on the ground were performed by using bolts having 50 cm long attached with epoxy resin.

TECHNICAL CONSIDERATIONS

Recognising the potential of the determination techniques using GPS technology in order to achieve a modern and precise reference, were considered useful to determine the spatial coordinates of these points with its. GPS technology is a technology of high performance and high precision depending on the following requirements in the recognition phase of land (*Table 1*).

[1] "Gheorghe Asachi" Technical University of Iaşi, Faculty of Civil Engineering and Building Services
[2] "Gheorghe Asachi" Technical University of Iaşi, Faculty of Hidrotechnics, Geodesy and Environmental Engineering

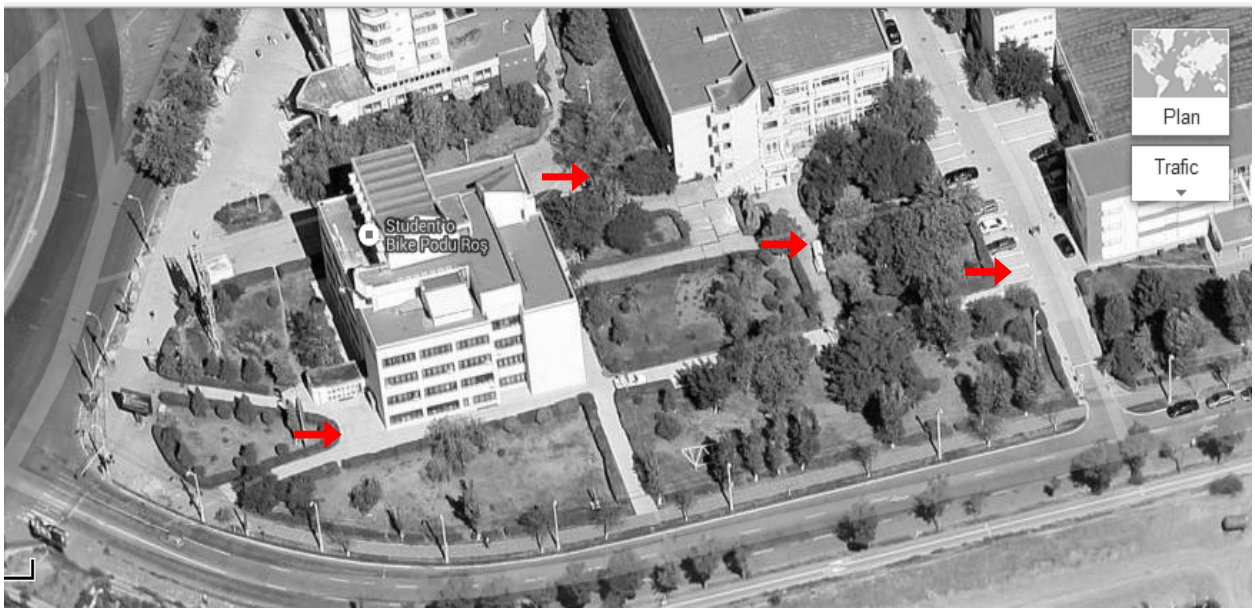

Figure 1 **Situation plan with landmark position**

Figure 2 **Landmark preparation**

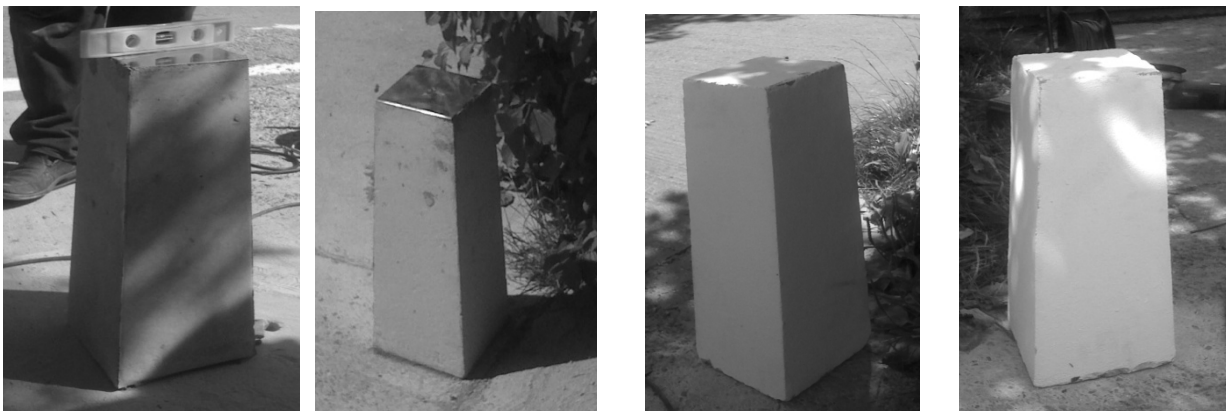

Figure 3 **Landmark's placing in the Faculty's couryard**

Table 1

Landscape recognition's exigencies

Satellites visibillity from the station points	Obstacles absence Interference souce's absence
The reference point's checks	Ground materialization of the points Its stability
Setting-up the logistic devices	Traveling manner Acces and travelling time Special equipment (if it is required)

The errors that may occures using GPS system in order to determine the spatial coordinates of a point are:

1. Number and integrity of orbital satellites (functional);
2. Delays in atmospheric layers and signal reflection;
3. Errors due to receiver clock and orbital errors;
4. The number of visible satellites, their position at a certain time and their selective availability (type of information access - free or secure).

It is relevant that the relief, the buildings, the electronic interference or sometimes even vegetation can block signal reception, causing position errors or even total lack of position. After placing the terminals according to the situation we proceeded to determine the spatial coordinates using GPS system with a device type that has a 0,001 ÷ 0,01 m.

The topic of of in-time monitoring of the building's displacements must represent an important goal for all engineering structures especially for those of vital importance. Such monitoring, by topographic methods, can detect on time fissures, subsidence and spatial displacements of engineering structures. It can be ordered the measures to prevent disasters such as breakage or loss of structural stability of dams by the occurrence of uncontrollable events that have not was set at the design stage. Monitoring structural displacements (having high precision measurements) will be performed by cyclic measuring the angular and linear values using topo-geodetic methods and instruments.

DESCRIPTION OF THE TOPOGRAPHIC ASSIGNEMENT

In order to determine the coordinates of the new points was used GNSS Permanent Stations National Network using RTK method: RTCM (Radio Technical Commission for Maritime Services).

Measurements were performed with GPS SOUTH S82T (Figure 4), whose field book has implemented software transcomputation real-time geographic coordinates obtained in STEREO-70 co-ordinate system.

Figure 4 **GPS SOUTH S82T system receiver**

From the permanent GNSS stations network were used fixed station IASI_2.3 and virtual station RO_MAC_3.1_GG. Solutions for new points determinated were fixed, the determination's accuracy beeing ranged from 0.034-0.010 meters (*Table 2*).

Table 2

Spatial Coordinates

Point No.	Landmark No.	Spatial Coordinates (m)
1	Landmark 1	X = 631322.924914503
		Y = 696501.349134151
		Z = 42.292677634
2	Landmark 2	X = 631330.945027274
		Y = 696470.342906836
		Z = 42.316413551
3	Landmark 3	X = 631339.145873853
		Y = 696436.915200467
		Z = 43.878840189
4	Landmark 4	X = 631291.464975507
		Y = 696407.847862142
		Z = 43.836351717

CONCLUSSIONS

The reference network is optimum territorial distributed, covering much of the area associated with our faculty and will help determine the

precise coordinates of all points used in the practical applications, ensuring efficiency and usefulness of this discipline and rigorous training of our graduates.

The improving of the quality of teaching and learning can be done by specific means of each discipline. Land Surveying specific to civil enginners could be improved by actions and requirements (specific to the didactic manner) that contribute effectively to the educaţional process.

REFERENCES

Kleusberg, A., 1990 - Comparing GPS and GLONASS,. GPS World, Vol. 1, No. 6, November/December, pp. 52.54.

Langley, R. B., 1997 - GLONASS: Review and Update,. GPS World, Vol. 8, No. 7, pp. 46.51.

Navtech Seminars and GPS Supply, 2001 - GPS/GNSS newsletter

Johnson, N. L., 1994 - GLONASS Spacecraft,. GPS World, Vol. 5, No. 11, pp. 51.58.

Bazlof, Y. A., et al., 1999 - GLONASS to GPS: A New Coordinate Transformation,. GPS World, Vol. 10, No. 1, pp. 54.58.

Commission of the European Communities, 2000 - Commission Communication to the European Parliament and the Council on GALILEO,. Brussels, Belgium

N. Boş, O. Iacobescu, 2007 - Topografie modernă, ed. C.H. Beck, Bucureşti

Navstar GPS System Surveying for Civil Engineering, Topography and Construction, Wexford College Press, ISBN: 9781934939178.