

TOPOGRAPHIC LIFTING OF THE ROAD LOCATED IN THE EXTRAVILAN LOCATION BRETEA ROMANA, HUNEDOARA COUNTY

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Abstract: Bretea Română is a commune in Hunedoara County, Transylvania, Romania, consisting of the villages of Băjălar, Bercu, Bretea Română (residence), Bretea Streiului, Covragiu, Gânțaga, Măceu, Ocolişu Mare, Plopi, Ruşi, Vâlcelele Bune, Vâlcele and Vâlcele. of the work is to draw up a topographic road survey, for the rehabilitation of the road outside the town of Bretea Română Hunedoara county, road with a length of 2005 m and a width of 6 - 16 m. topographic, topographic plans at a scale of 1: 2000, in STEREOGRAPHIC system 1970, reference level Black Sea. In order to carry out the work, a topographic survey of the site was necessary at a scale of 1: 2000, and for the radiated points the rectangular coordinates were calculated in STEREOGRAPHIC 1970 system, and then with their help the plan and analytical calculation of the surface were drafted. Specialized programs were used to calculate the rectangular coordinates and the analytical calculation of the surfaces, and the data will be loaded and then processed in AutoCAD. AutoCAD is a CAD program used in the design of construction plans in two dimensions (2D), less in three dimensions (3D), developed and marketed by the American company Autodesk. The system-specific ('native') files are the dwg type, as well as the dxf (Drawing eXchange Format) files, which are extremely widespread. Although it was originally created to run on platforms such as Unix and Macintosh, its development was abandoned in favor of the Windows operating system. AutoCAD - computer aided design - is the most common environment for computer aided graphics and design, successfully used in fields such as architecture, geography, medicine, astronomy, technology, etc. The Hi-Target V30 GPS was used to make the measurements, angles and distances.

Keywords: AutoCAD, Autodesk, dwg, dwf, GPS Hi - Target V30

INTRODUCTION

In the last years ANCP (Agency for Cadastre and Real Estate Advertising) has realized and included a modernization project specific to the national geodetic network, where it managed to install several equipment's, which are constituted in a geodetic network of permanent stations that can be found under the name of permanent GNSS stations (ŞMULEAC ET ALL, 2012, 2014, 2015).. With the completion of the placement of these permanent stations throughout the country, there appeared the problem of uniformization specific to the way of making the GNSS measurement files and all the other documentation using these methods. In accordance with Decision No.1 of 2009 regarding GNSS measurements, in September the ROMPOS (Romanian Position Determination System) system was developed and launched, this system including real-time positioning services and which includes the promotion of the realization determinations coordinated by GNSS measurements (POPESCU ET ALL, 2016; ŞMULEAC ET ALL, 2020).

ROMPOS is a Romanian position determination system that ensures accurate positioning in the European reference and coordinate system ETRS89. ROMPOS is based on satellite navigation systems (GNSS - Global Navigation Satellite Systems) including GPS, Glonass and Galileo and based on the national network of permanent GNSS stations (HERBEI ET ALL, 2018, MITA ET ALL, 2020). ROMPOS is used especially in geodesy, cadastral, photogrammetry, topography, mapping, GIS works (HERBEI ET ALL, 2013), and can be used in

other areas of activity in which the position determination is based on global satellite navigation systems: terrestrial, maritime and river navigation, disaster management, geodynamics or meteorology (ŞMULEAC ET ALL, 2019).

MATERIAL AND METHODS

The topographic survey was carried out in the commune of Bretea Romana, Hunedoara county and for the measurements the GPS Hi Target V 30 (ŞMULEAC ET ALL, 2017) equipment was performed (figure 1).



Fig. 1. The Hi-Target V30 receiver

The Hi-Target V30 receiver is a perfect combination of the quality of the materials used in its manufacture and the technology applied. Hi-Target V30 receiver for GNSS RTK measurements is a system that receives signals from multiple satellite constellations, designed to work with the network of ROMPOS reference stations. For the production of the receiver special materials were used, due to the fact that the Hi-Target V30 repeater is extremely resistant to the most difficult weather conditions, it can withstand even under water.

In the first stage of the work we used to perform GPS measurements (Şmuleac et al, 2014) the dynamic method for data acquisition. The working mode with the V30 receiver can be: rover, base or static. All the working methods as well as the control over the GSM module, the internal radio or the external radio are made from the controller that comes with the Hi-Survey software with which you can modify the working mode. No key combinations are required to enter static mode, for example. At the same time, the measurement software shows the battery level of both the receiver and the controller.

For the post-processing of the data (ŞMULEAC ET ALL, 2015, 2019) obtained from the field, the RINEX data from the Permanent Stations were also acquired, which together with the data acquired on the field was done post-processing and obtaining WGS 1984 coordinates of the stationed terminals (figure 2).



Fig. 2. GNSS system

In the second stage we went to the office work where the raw data transformation (RAW DATA) from the ETRS89 system to the STEREO'70 system (ŞMULEAC ET ALL, 2012, 2014) was performed, which was carried out during the work with the TransDatRO program, after which the points in AutoCAD were reported with TopoLT program help and comparison with RTK values obtained from readings. The data comparison was made between the GOS RTK values obtained, the Static GPS values obtained from the post-processing and the GPS Radio (Mita et all, 2020, Şmuleac et all, 2015) values obtained from the post-processing. The coordinate trans-calculation from the ETRS'89 reference system to the Stereographic '70 system was made using the TransDAT 4.01 software produced by A.N.C.P.I.

RESULTS AND DISCUSSIONS

In order to make the measurements, the following steps have been taken:

1. Planning GPS measurements - at this stage I tried to use the time intervals where the GDOP (Geometric Dilution of Precision) value is small. This GDOP value helps us analyze the influence of the geometry of the available satellites (figure 3) over the work area. It is ideal to choose working sessions when there are at least 5 satellites with an elevation of over 15 degrees, and the GDOP value less than 4 (figure 4) for both the reference station (figure 5) and the mobile station (POPESCU ET ALL; 2016; ŞMULEAC ET ALL, 2017, 2019).

2. Preparatory stage - in this stage we aim to obtain as much data as possible, comparing them for starting the stages in the field, we recall the data collection and the establishment of the working method and the necessary equipment.

Regarding the establishment of the working method, after analyzing all the data and information related to this project, as well as the specifications, a network of topographic surveying was carried out.

3. Field stage - in the first phase, the land was recognized following the following steps: announcing the authorities, identifying the access routes to the old points of the state geodetic network, checking the coverage area with the GSM system. Before leaving the field to carry out the measurements, the potential risks that might arise during the measurements were checked.

The second phase of the office contains the actual measurements, also here the field files are completed where all the fields in the smallest details are carefully and meticulously completed.

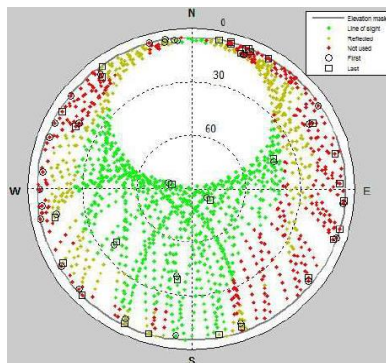


Fig. 3. Constellation and trajectory

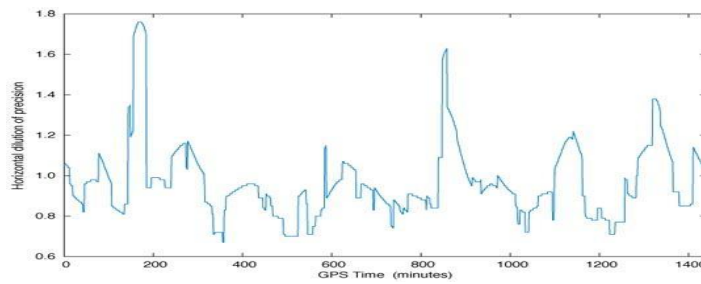


Fig. 4. GDOP values chart

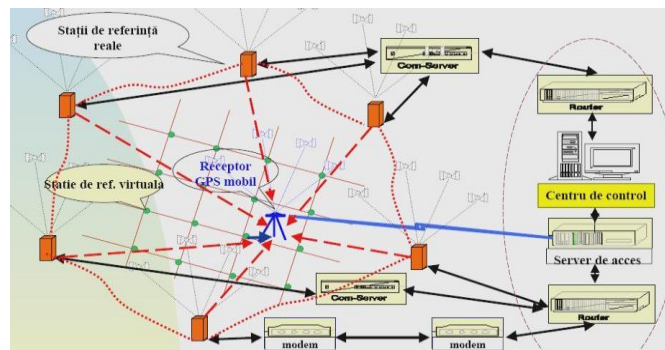


Fig. 5. Presentation of the reference stations

Another important aspect is the good synchronization of all operators for the moment of starting and stopping the measurement sessions, which is easy to achieve in this project due to GSM technology.

4. Office Stage - In this stage the data processing is represented, which represents the last and most important stage of the work, it must be done very carefully, especially when entering the raw data from different working sessions and their correct correlation. Although the current processors automatically process the data, special attention will be paid to the post-processing, and the result of the post-processing is good when the precision of the determination of the points is millimetric.

Post-processing of data:

In the post-processing phase (Șmuleac et al, 2017, 2019) of the data, all the data files downloaded from the receivers into the software are loaded, the field files are carefully followed. In our case, we closely watched the completion of the data relating to our device with which the measurements were made.

CONCLUSIONS

Considering the accuracy of the measurements obtained on each point following the network compensation, and comparing the data we can specify the following:

- in order to carry out the topographic survey of the road network in Bretea Română commune, the following field measurements were performed:

a) the values obtained from the GPS measurements, by RTK (Real Time Kinematic) method

b) the values obtained from the GPS measurements by the dynamic method,

- The method is practical, but requires the respect of the conies regarding the correct and efficient planning of a GPS campaign

- GPS support points can be used in the topographic surveys, regardless of the method used, in the occurrence of Santamarie-Orlea Hunedoara county (figure 6).

- from the technical point of view the work ensures the specifications required by the specifications and the technical norms in force

- the results obtained after the verification highlight the good quality of the GPS determinations, especially the dynamic ones.



Fig. 6. Hunedoara's map

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