REALIZATION AND INCREASE DENSITY OF POINTS FOR THE GEODETIC NETWORK BY G.N.S.S. MEASUREMENTS IN THE U.A.T. ZARAND

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Abstract: *The Administrative-Territorial Unit (UAT) Zarand is located in the North-East part of Arad municipality. Zarand village is made up of the localities Zarand and Cintei, having the locality of Zarand as a village residence, county Arad, region Crisana, România country. Zarand Village is located at 37 km from the Center of Arad Municipality. The present study aims to increase density of points for the geodetic network by G.N.S.S. measurements in order to prepare the topographic and cadastral documentation in analogous and digital format for „SYSTEMATIC REGISTRATION SERVICE AND INTEGRATED CADASTRE AND LAND BOOK OF PROPERTIES LOCATED IN THE U.A.T. ZARAND FROM ARAD COUNTY" The measurements were performed entirely with the help of satellite technology. To achieve this geodetic network, the following topo-geodetic works were performed: A. Global Navigation Satellite System (G.N.S.S.) measurements by the STATIC method for increase density of points for the support network; B. Global Navigation Satellite System (G.N.S.S.) measurements by the RADIO method for increase density of points for the support network; When choosing the points that will increase density of the national network and that are to be determined by G.N.S.S. measurements, we are following this criteria: 1. The conservation of the point to be ensured for a long time; 2. To be visible from 15g over the skyline; 3. G.N.S.S. receivers were set to collect data every 5 seconds; 4. Be accessible to any weather conditions; 5. The basic points that are determined to be further used in the other works; 6. There should be no high power electrical installations near stations or emission relays. The measurements were performed by the "STATIC" method with the following equipment: 2 dual frequency receivers L1 / L2 by Leica Viva GS08 G.P.S. type. Having as references the points from the ROMPOS (is a Romanian position determination system that ensures precise positioning in the European reference and coordinate system ETRS89) national geodetic network (Arad, Faget, Resita and Timisoara) and 13 new points were determined in the area of Zarand and Cintei localities Arad county points that form and increase density of points for the geodetic network. The field marking for the network was made from special plastic or concrete (FENO), where placed 4 marks for each locality, and we placed three Feno terminals outside the locality and we used two other DTM signals that could be used to cover the entire Administrative-Territorial Unit (U.A.T.). For increase density of points for the geodetic network by satellite measurements it was necessary stationing on higher order points (ground pyramids).*

Keywords: *Leica Viva GS08, Leica Geosystems, Leica FlexLine TS06, Leica FlexLine TS06plus, Leica TS16*

INTRODUCTION

The Administrative Territorial Unit (UAT) Zarand is located in the North-East part of Arad municipality. Zarand village is made up of the localities Zarand and Cintei, having the locality of Zarand as a village residence, county Arad, region Crisana, România country. Zarand Village is located at 37 km from the Center of Arad Municipality (figure 1).

The present study aims to increase density of points for the geodetic network by G.N.S.S. measurements (ȘMULEAC ET ALL 2013, 2014, 2015, 2017) in order to prepare the topographic and cadastral documentation in analogous and digital format for „SYSTEMATIC

REGISTRATION SERVICE AND INTEGRATED CADASTRE AND LAND BOOK OF PROPERTIES LOCATED IN THE U.A.T. ZARAND FROM ARAD COUNTY" (figure 2).

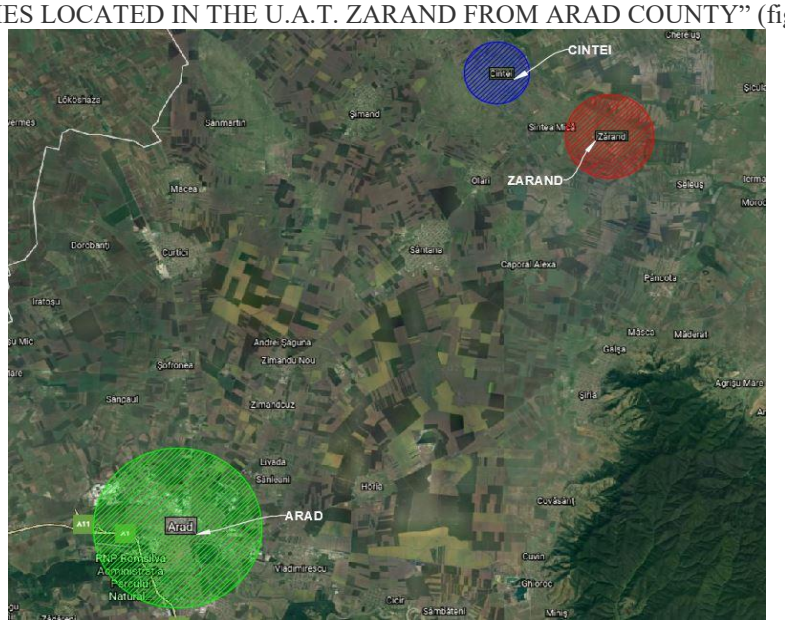


Fig. 1. The location of the studied area

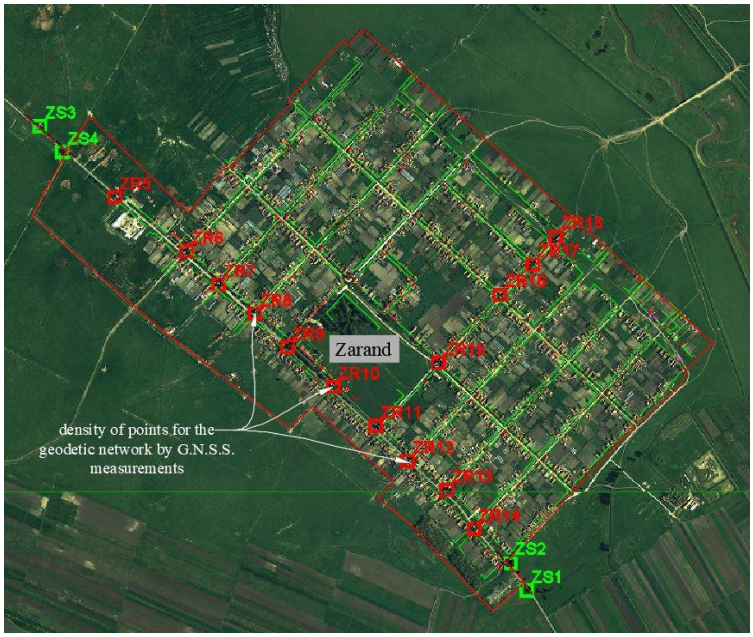


Fig.2. U.A.T. ZARAND- LOCALITY ZARAND

Fig.3. U.A.T. ZARAND- LOCALITY CINTEI

MATERIALS AND METHODS

The measurements were performed entirely with the help of satellite technology (ȘMULEAC ET AL. 2017, 2019, 2020). To achieve this geodetic network, the following topo-geodetic works were performed: A. Global Navigation Satellite System (G.N.S.S.) measurements by the STATIC method for increase the density of points for the support network; B. Global Navigation Satellite System (G.N.S.S.) measurements by the RADIO method for increase the density of points for the support network; (figure 3).

A. Global Navigation Satellite System (G.N.S.S.) measurements by the STATIC method for increase density of points for the support network;

Table 1

Points from the NATIONAL GEODESIC NETWORK (G.N.S.S. ROMPOS)

No. Crt.	Name	ID	B[m]	L[m]	He[m]
1	Arad	ARAD	46°10'23.51005"N	21°20'40.51046"E	167.684
2	Faget	FAGE	45°51'16.42753"N	22°10'37.78289"E	216.490
3	Resita	RESI	45°17'34.45921"N	21°53'54.54481"E	300.238
4	Timisoara	TIM1	45°46'47.65264"N	21°13'51.46341"E	154.714

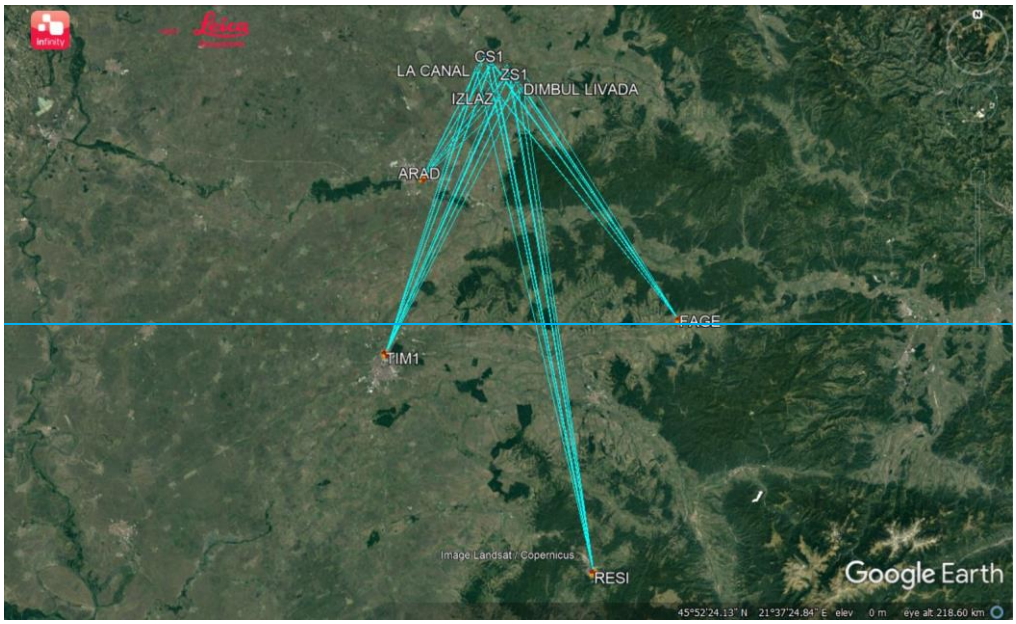


Fig. 4. Points from the NATIONAL GEODESIC NETWORK

The measurements were performed by the "STATIC" method with the following equipment: 2 dual frequency receivers L1 / L2 by Leica Viva GS08 G.P.S. type (figure 4). Having as references the points from the ROMPOS (is a Romanian position determination system that ensures precise positioning in the European reference and coordinate system ETRS89) national geodetic network (Arad, Faget, Resita and Timisoara, figure 3, table 2).

Table 2

The state of the pyramids

Geodesic signal	Condition	X(m)	Y(m)	Z(m)
PADUREASA NEAGRA	Destroyed	558466,112	236021,439	-
IN ALBII	Destroyed	554209,239	232228,26	-
LA TRISALA	Destroyed	5506569,759	237087,289	-
HIRICAI	Very Good	553587,899	240544,289	104,325
HOLUMB	Good	552481,322	244647,126	102,195
LA PAR	Destroyed	549021,345	240688,611	-
DIMBUL LIVADA	Very Good	547727,013	244342,145	106,135
CAPPORAL ALEXA IZALAZ	Destroyed	546487,752	236528,721	-

When choosing the points that will increase density of the national network and that are to be determined by G.N.S.S. measurements, we are following this criteria:

1. The conservation of the point to be ensured for a long time (ȘMULEAC ET AL 2012);

2. To be visible from 15g over the skyline;

3. G.N.S.S. receivers were set to collect data every 5 seconds;
4. Be accessible to any weather conditions;
5. The basic points that are determined to be further used in the other works;
6. There should be no high power electrical installations near stations or emission relays.

For increase density of points for the geodetic network by satellite measurements it was necessary stationing on higher order points (figure 4).

DIMBUL LIVADA HIRCAI HOLUMB PADUREA DEASA

Fig. 5. Higher order points

B. Global Navigation Satellite System (G.N.S.S.) measurements by the RADIO method for increase density of points for the support network;

The measurements were performed by the radio procedure with the following equipment: 2 Leica 1200 GNSS receivers double frequency L1 + L2, (figure 5) with reference to a local fixed station (ȘMULEAC ET AL. 2017; MITA ET AL. 2020; HERBEI ET AL. 2018).

The topographic surveys by radio method were performed using 2 Leica 1200 GNSS receivers (figure 6), where one was used as a reference station (base) and the radio determinations were made with the other equipment (rover).

For each radio reading, after mounting the base on a statically determined feno landmark (figure 7) with known coordinates, rover readings were made for all other feno type terminals and implicitly metal bolts (figure 8). For radio method determinations for feno terminals and metal bolts, comparisons were also made with data obtained by the Real Time Kinematic (RTK) method (POPESCU ET AL. 2016; ȘMULEAC ET AL. 2020). The coordinate differences were maximum 1-5 cm on X, Y and Z after 10 seconds of occupancy.

Required tools:

Fig. 6. Leica Viva GS08 G.P.S.

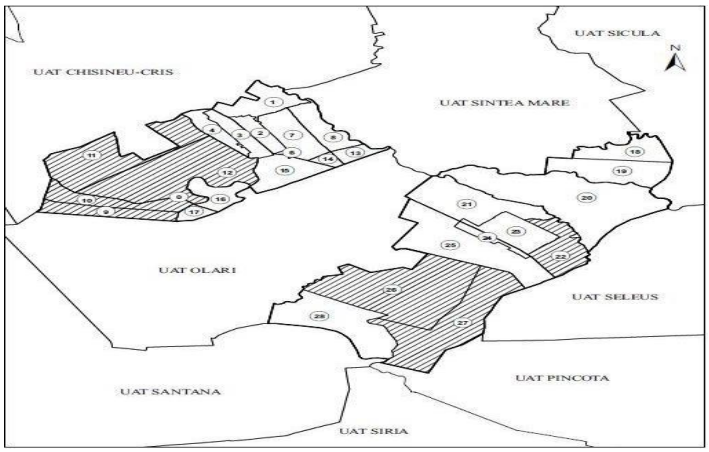
Fig. 7. Leica 1200 GNSS

Fig. 8. Feno landmark

Fig. 9. Metal bolts

CONCLUSIONS

The role of „SYSTEMATIC REGISTRATION SERVICE AND INTEGRATED CADASTRE AND LAND BOOK OF PROPERTIES LOCATED IN THE U.A.T. ZARAND FROM ARAD COUNTY" is to facilitate the identification of the land in the area with multiple possibilities of improving the existing land.



In conclusion with a clear evidence of the land, it is much easier to value and improve the area.

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