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3. Aims of the project





5. Reasons, which lead to the necessity of application of GNSS technologies:









7. The specific application of geodetic measurements in RTK mode in the project



8. Advantages and disadvantages of 3D terrestrial laser scanning for the project



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9. Some of the advantages and disadvantages of the satellite technology in our specific case



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Fig. 1 3D laser scanning of administrative building with specific geometry

11. Data delivery from the 3D laser scanning

Visual interpretation of 3D data



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Fig. 2 Coordinated huge number of points in the vicinity of the buildings

11. Data delivery from the 3D laser scanning



Fig. 3 Points, measured on the rubble

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12. Results from the geodetic measurements and data processing



Advanced	Overall residual error: 0.001 m				
Unmatch	🖉 Auto-match all	Auto-match Station			

tation	Corresponding Target	Scan Per	Residual Error	Delta N	Delta E	Delta El	Fitting Error
			0.001 m				
	005	2	0.000 m	0.000 m	-0.000 m	-0.000 m	0.000 m
	002	2	0.001 m	0.000 m	-0.000 m	-0.001 m	0.001 m
	001	2	0.001 m	-0.001 m	-0.001 m	0.000 m	0.001 m
	003	2	0.001 m	0.001 m	0.001 m	0.000 m	0.001 m
	004	2	0.000 m	-0.000 m	-0.000 m	0.000 m	0.001 m
			0.001 m				
	001	2	0.001 m	0.001 m	0.001 m	-0.000 m	0.000 m
	002	2	0.001 m	-0.000 m	0.000 m	0.001 m	0.001 m
	003	2	0.001 m	-0.001 m	-0.001 m	-0.000 m	0.000 m
	004	2	0.000 m	0.000 m	0.000 m	-0.000 m	0.001 m
	005	2	0.000 m	-0.000 m	0.000 m	0.000 m	0.001 m



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Fig. 4 Results from the quality control - registration of two of the stations of the scanner

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12. Results from the geodetic measurements and data processing



Fig. 5 Results from the quality control of the GNSS measurements in RTK mode

13. Merging of the results from the geodetic measurements. Creation of the digital model



13. Merging of the results from the geodetic measurements. Creation of the digital model



Fig. 6 Creation of a horizontal cross-section of an industrial building

14. Conclusion. Recommendations. Future Work

1. The mentioned disadvantages of the 3D terrestrial laser scanning and GNSS technologies <u>did not in</u> <u>any way decreased</u> the overall productivity.

2. The listed **disadvantages** of each one of the technologies were "*eliminated*" by the advantages of the other. 3. The geodesist could benefit from one **combination** of the nowadays technical possibilities (*incl. the cloud*), which leads to **productive way** for conducting of the geodetic measurements, data processing and interpretation of the final results.

4. In our specific case were used **highly accurate data** from both 3D terrestrial laser scanning and GNSS measurements.

5. The applied technologies produced **large volume of spatial information**, which was used for the creation of the project for vertical planning of the territory.

14. Conclusion. Recommendations. Future Work

Taking in mind the 3D geometry of the buildings, also the scale of the object, it could be noted -

the *applied way of combination* of the data from the measurements successfully fulfilled the requirements for *productivity of the process, accuracy and completeness* of the created final digital model.

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Based on:

1. Overall residual error (0.001m) from the registration report of the laser scanning;

2. Position and height quality (0.01m) of the GNSS measurements in RTK mode;

3. The given information in points 1-3 above,

it could be highly recommended the joint usage of the mentioned equipment in the geodetic practice.

14. Conclusion. Recommendations. Future Work

Future work. The necessary attention should be concentrated on possible update of the relevant normative documents in order to meet the challenges, given by the nowadays technical possibilities of the geodetic instruments and software.

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- 5. <u>http://tinyurl.com/pttjzxh</u> (in French)
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- 7. http://tinyurl.com/gtogvbm
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USED SOFTWARE

- 1. Autodesk AutoCAD (<u>http://tinyurl.com/zc9mot3)</u>;
- 2. Geomax Geo Office (<u>http://tinyurl.com/h9s4aop</u>);
- 3. Mkad (<u>http://tinyurl.com/hapgi9l</u>- in Bulgarian);
- 4. Trimble RealWorks (<u>http://tinyurl.com/pdckrlr</u>).

Thank you for your attention!

