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INTEGRATION OF GNSS AND TOTAL STATION SURVEYS FOR TOPOGRAPHIC MAPPING AND LANDSCAPE PLANNING AT THE UNIVERSITY OF LIFE SCIENCES IN TIMIȘOARA

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Introduction

Accurate topographic information is essential for landscape planning, infrastructure development, and sustainable water management. University campuses require updated spatial data to support the organization of green spaces, pedestrian routes, buildings, and irrigation systems. The integration of GNSS technology and total station measurements provides complementary solutions for collecting reliable planimetric and altimetric information. GNSS supports positioning in open areas, while total stations enable detailed surveys near buildings and vegetation. This study focuses on updating the topographic documentation of a sector within the University of Life Sciences campus in Timișoara, using modern surveying technologies to support landscape design, irrigation planning, and efficient management of outdoor spaces.

Material and method

Topographic measurements were conducted in April 2026 on the University of Life Sciences campus in Timișoara, using a Leica TS07 total station and a Leica GS08 GNSS receiver. The survey included buildings, pedestrian paths, platforms, vegetation areas, and infrastructure elements. The methodology involved collecting and organizing spatial observations, verifying coordinate and elevation records, and integrating the information into updated topographic documentation. Data processing included separating GNSS reference records from local survey points and examining their spatial and altimetric distribution. The resulting topographic plan was updated in AutoCAD and examined alongside the existing documentation and the proposed landscape design. Particular attention was given to terrain elevations, irrigation infrastructure, green spaces, and possible conflicts between proposed interventions and existing facilities.

Result and discussions

The updated topographic plan provides a detailed representation of buildings, pedestrian routes, vegetation, and existing infrastructure within the studied campus sector (Fig. 1).

Field measurements using the Leica TS07 total station and Leica GS08 GNSS receiver supported the collection of complementary spatial information (Fig. 2).

The analysis identified 243 local records from the total station and 150 local GNSS records, after excluding three reference entries.

The proposed landscape plan illustrates the organization of green spaces, pedestrian circulation, and potential irrigation infrastructure (Fig. 3).

The recorded elevations ranged from 90.240 to 90.909 m for the TS07 dataset and from 89.731 to 90.841 m for the GS08 dataset (Fig. 4).

These ranges reflect different sets of measured points and do not represent a direct comparison of instrument accuracy. The landscape visualizations demonstrate the potential integration of vegetation, outdoor facilities, and irrigation infrastructure into the existing university environment (Fig. 5).

The updated topographic documentation provides a technical basis for identifying spatial constraints and supporting subsequent landscape and hydraulic design.

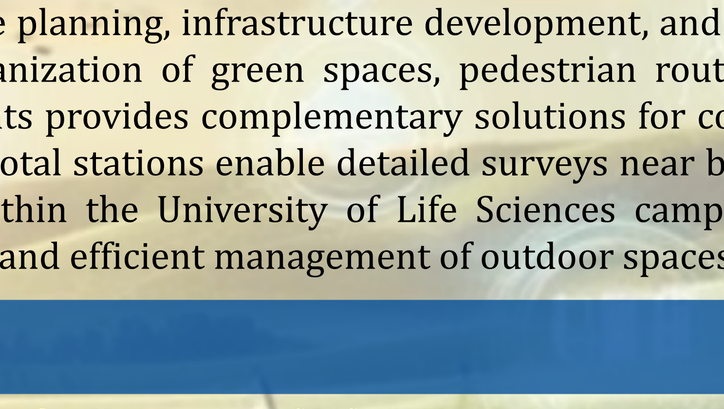

Fig. 1 – Updated topographic plan

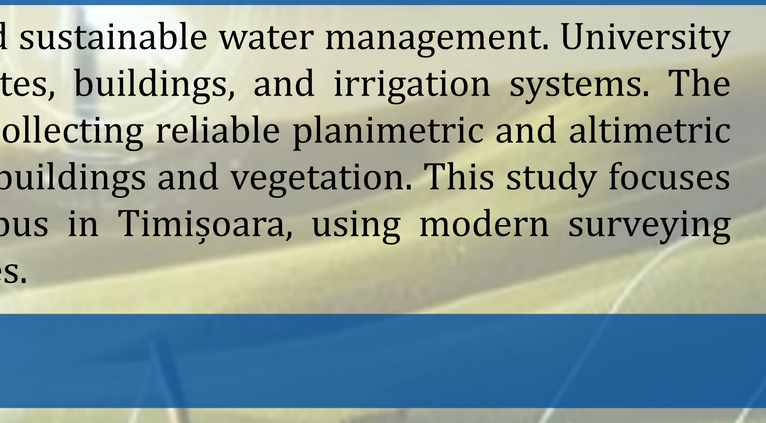

Fig. 2 – Leica TS07 and GS08 surveys



Fig. 3 – Proposed landscape plan

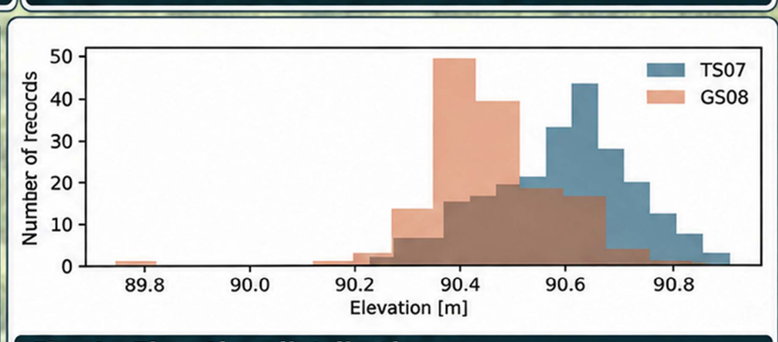

Fig. 4 - Elevation distributions

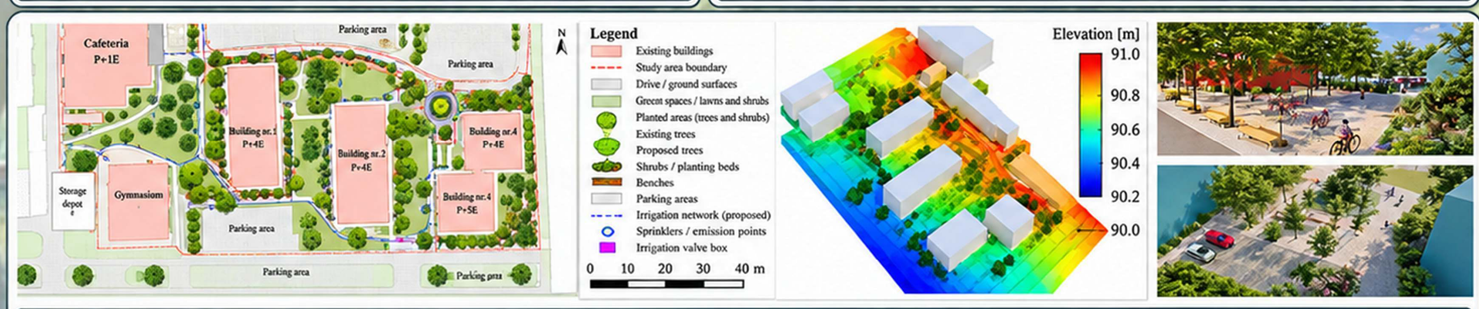

Fig. 5 - Landscape design views

Conclusions

The study highlights the importance of integrating GNSS technology and total station measurements for updating topographic documentation and supporting landscape planning at the University of Life Sciences in Timișoara. The analysis identified 243 records from the Leica TS07 total station and 150 local GNSS records from the Leica GS08 receiver. The updated topographic plan provides essential spatial information on buildings, pedestrian routes, vegetation, terrain elevations, and existing infrastructure. The results demonstrate the practical value of accurate topographic data for planning green spaces, irrigation networks, and outdoor facilities. Further verification of terrain elevations, underground utilities, and hydraulic requirements is necessary before implementing the proposed landscaping solutions.

Overall, the integration of modern surveying technologies provides a reliable technical basis for coordinated landscape design and sustainable management of university green spaces.

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