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Construction of the Local Geodetic Network for the City of Has, Albania

Bledar Sina[1], Eduart Blloshmi[2], Arli Llabani[2]
[1]Faculty of Civil Engineering/Polytechnic University of Tirana
Rruga Muhamet Gjollesha, 1010, Tirana, Albania
bledar.sina@fin.edu.al; eduart.blloshmi@fin.edu.al; arli.llabani@fin.edu.al
[2]Faculty of Civil Engineering/Polytechnic University of Tirana
Rruga Muhamet Gjollesha, 1010, Tirana, Albania

Extended Abstract

The establishment of a precise and reliable geodetic network is pivotal for various applications, including urban planning, infrastructure development, environmental monitoring, and cadastral mapping. This study focuses on the construction of a local geodetic network for the city of Has, Albania, a region requiring updated and accurate geospatial data to support its developmental initiatives. The methodology encompasses the integration of modern geodetic techniques and instruments, including Global Navigation Satellite Systems (GNSS), Total Stations, and high-precision leveling, to achieve the required accuracy and reliability standards [1].

The initial phase involved a thorough analysis of the existing geodetic control points and their adequacy for current needs. A reconnaissance survey was conducted to identify optimal locations for new control points, considering factors such as accessibility, visibility, and stability. This survey was crucial in determining the strategic placement of new points to ensure comprehensive coverage and intervisibility, which are essential for network robustness [2].

Subsequently, high-precision GNSS observations were carried out to establish primary control points. Dual-frequency GNSS receivers were employed to measure the coordinates of these points with centimeter-level accuracy. These observations were processed using differential correction techniques, referencing a nearby Continuously Operating Reference Station (CORS) to mitigate errors due to atmospheric disturbances and satellite geometry [3].

To enhance the network's precision, secondary control points were established using Total Stations. These instruments provided angular and distance measurements, facilitating the densification of the network. The data from the Total Stations were integrated with the GNSS observations through a rigorous least-squares adjustment, ensuring consistency and accuracy across the entire network [4].

High-precision leveling was conducted to determine the orthometric heights of the control points. This process involved using digital levels and invar rods to minimize errors and achieve sub-millimeter precision. The leveling data were adjusted to fit the existing national vertical datum, ensuring compatibility with broader geodetic frameworks [5].

The integration of GNSS, Total Station, and leveling data culminated in a robust local geodetic network for Has. The network's accuracy was validated through various statistical analyses, including the evaluation of residuals and the application of network adjustment principles. The results indicated that the network met the desired accuracy standards, providing a reliable geospatial framework for the city [6].

The implementation of this geodetic network presents numerous benefits for Has. It offers a foundational framework for precise mapping and surveying activities, crucial for urban planning and development. The network supports infrastructure projects by providing accurate geospatial data, which is essential for construction, maintenance, and management. Furthermore, it facilitates environmental monitoring by enabling the precise measurement of land changes and natural phenomena [7].

In conclusion, the construction of the local geodetic network for the city of Has, Albania, demonstrates the effective application of contemporary geodetic techniques and instruments. This project not only enhances the city's geospatial infrastructure but also serves as a model for similar initiatives in other regions. The newly established network provides a robust, accurate, and reliable geospatial foundation that will support Has's developmental and environmental objectives for years to come.

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