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Finite Element Geodetic Datum Transformation: Case Study, Palestine

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Abstract

This research aims to apply datum transformation to transform between different coordinate systems using finite element. In the targeted area, there are several old coordinate systems in use, and there is a new, general, and comprehensive coordinate system. The idea lies in converting between these systems. In this way, all coordinate systems of the data used are converted to the new system.

The finite element approach divides the studied region into elements based on area, geography, observation density, and points. Seven parameters are used in this process: displacement in x, y and z, rotation in x, y and z, scale, and batch boundary and overlap analysis. Calculating the seven parameters transforms the systems. Both old and new coordinates are known for sites dispersed across the targeted area. Least squares solve finite elements for transformation parameters. This method should enable researchers, geodesy experts, and students link and apply old system data to the new system.

Finally, the seven main parameters will be obtained after dividing the study area into several sections. For each section, seven parameters will be defined, and all surrounding conditions will be taken into account to achieve the highest possible accuracy in determining the seven main parameters that represent the entire study area. Additionally, the results will be prepared in different file formats that can be used in geodetic, GIS software, and for GNSS data collectors. These results will contribute to the advancement of the scientific field and practical applications related to coordinate systems in the target area.