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# GEODESY AND GEOGRAPHIC INFORMATION SYSTEMS

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***Abstract: Geodesy and Geographic Information Systems (GIS)*** *are fields that have become widely used globally through modern discoveries and technologies. Geodesy is the science that studies the shape and dimensions of the Earth's surface, with precise and accurate measurements being crucial in infrastructure and development projects. Geographic Information Systems, based on geodetic data, allow the storage, analysis, and visualization of geographic information. GIS technologies enable the expansion, management, and optimization of data. These systems are applied in various fields, including urban planning, ecology, transportation, and agriculture.*

***Key words:****Geodesy, Geographic Information Systems (GIS), Earth's surface, Measurements, Infrastructure, Development projects, Data storage, Data analysis, Visualization, Technologies.*

Geodesy and Geographic Information Systems (GIS) enable accurate and precise analysis of the Earth's measurements, shapes, and characteristics using modern sciences and technologies. There is a strong connection between these fields, and they

are widely used in scientific research, infrastructure projects, urban planning, and environmental monitoring. Geodesy is a scientific discipline that studies the shape, dimensions, and gravitational field of the Earth. Its primary goal is to measure the Earth's form and composition with precision. Geodetic measurements are also applied in fields such as geophysics, meteorology, and navigation. This science plays a fundamental role in determining exact points on the Earth's surface, creating maps, and calculating distances. With the help of geodetic surveys, infrastructure projects, roads, bridges, and other structures can be accurately planned and positioned.

**Geographic Information Systems (GIS)** are computer-based systems used for collecting, storing, analyzing, and visualizing spatial data. GIS allows for the integration of data obtained through geodesy and the creation of descriptive maps used in various fields. For example, GIS technologies are applied in urban planning to determine the placement of buildings, monitor environmental changes, optimize transportation systems, manage agricultural land, and more. The integration of geodesy and GIS technologies enables the rapid and accurate analysis of spatial data. This integration is crucial in project planning, especially in urban development and natural resource management. For instance, GIS can support decision-making in urban planning by analyzing the locations of structures, transportation connectivity, and environmental impacts. GIS technologies include all the tools necessary for working with geographic data. These systems integrate cartography, remote sensing, GPS (Global Positioning System), and other technologies. Using GIS databases, complete maps of specific areas can be generated, and the data can be analyzed to support decision-making processes.

**Applications of Geodesy and GIS in Various Fields:**

1. **Urban Planning**: GIS enables the analysis of land use and infrastructure for city development and management. It helps make informed decisions when planning new residential areas or industrial zones.
2. **Ecology**: With the help of GIS and geodesy, natural resource monitoring, identification of environmental hazards, and the development of conservation projects become possible. GIS is especially vital for monitoring forests, rivers, and other natural areas and assessing their conditions.

3. **Transportation**: GIS technologies assist in analyzing transportation systems. For example, GIS is used to collect data necessary to optimize roads, bridges, and other transport infrastructure.
4. **Agriculture**: In agriculture, GIS systems are used to collect and analyze data for land and crop management, efficient use of water resources, and application of pesticides and fertilizers.

The integration between geodesy and GIS enables the analysis of geodetic data stored in databases and the extraction of valuable insights across various fields. For example, in planning the construction of a city, GIS can analyze the area's dimensions, soil composition, transport systems, and environmental factors to facilitate effective decision-making. Moreover, the collaboration between geodesy and GIS is essential in disaster prevention and management—such as in the case of earthquakes, floods, and other natural hazards.

## CONCLUSION

Geodesy and Geographic Information Systems (GIS) have become an essential part of modern technology. They are widely applied not only in scientific and technical fields but also in sectors such as economics, ecology, and urban planning. These technologies enable environmental improvement, efficient resource management, and the successful implementation of various projects. The integration between geodesy and GIS significantly contributes to the ongoing development and advancement of these fields.

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