

A Study on Real-Time Ground Subsidence Database Construction for Underground Safety Monitoring

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Abstract:

In the Republic of Korea, the increasing occurrence of ground subsidence incidents has highlighted the need for real-time monitoring and rapid response to mitigate potential risks. This study proposes a real-time database construction framework for the seven key ground subsidence factors selected for the development of a real-time high-resolution ground subsidence hazard map. To establish a standardized ground subsidence database, this study presents a framework for database standardization and a real-time integration system that enables interoperability between national information systems managing individual ground subsidence factors.

To achieve this objective, four national information systems that collect and manage ground subsidence-related information were investigated and analyzed: the Underground Safety Information System, the Facility Management System, the Underground Information Utilization System, and the Construction Safety Information System. The database structures, detailed system architectures, and operational characteristics of these systems were comprehensively examined. Based on the analysis, the relationships between the proposed ground subsidence database and the existing databases were identified, and a standardized database integration model was developed. Furthermore, a real-time database integration framework was established with consideration of stability, responsiveness, and long-term sustainability.

The results of this study establish a standardized integration database for real-time ground subsidence factors through comprehensive analyses of the database structures and system architectures of national information systems. Based on the standardized integration database, a sustainable, reliable, and efficient real-time database construction framework utilizing a RESTful API architecture is proposed.

The proposed framework is expected to provide the core database for identifying priority areas for detailed ground subsidence investigations in urban regions and to support local governments in making data-driven decisions for ground subsidence prevention and underground safety management.

Keywords:

Ground Subsidence, National Information System, Data Integration, Database Standardization, RESTful API

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