3D Construction Management System for Underground Geo-spatial Information

The 3D Construction Management System uses GPS-based 3D models to manage information on underground utilities such as power and gas pipelines. This technology enhances the efficiency of design, construction, and maintenance processes, contributing to improved construction quality and management effectiveness.

The platform integrates essential data for the design, construction, and maintenance of underground facilities, ensuring higher construction performance and quality. It also aids in improving maintenance efficiency and contributes to safety by preventing potential accidents during additional construction work.

▲ The facility manager is checking the location and attributes of 3D underground facilities based on augmented reality.

Issues to Tackle

- After completion, underground facilities often lack tracking data for management authorities, causing gaps in management oversight. 2D maps make it difficult to confirm accurate locations, leading to design errors and rework.
- Verifying information on underground facilities such as power, communication, and gas pipelines is challenging, increasing the risk of accidents and delays during additional construction work.

Expected Benefits

- Simplified and accurate pre-construction checks of underground facilities, such as power, communication, and gas pipelines, using virtual 3D maps, reducing construction time.
- Improved on-site management and safety through accurate maintenance of underground facilities using high-precision GPS data and augmented reality.

Key Services

· Generates 3D construction information models by combining underground facility design diagrams with precise GPS-measured attribute data for underground facilities.

· Monitors real-time project progress and manages underground facilities by integrating construction, maintenance, and management data; Facility managers can use smart devices and augmented reality (AR) to intuitively check 3D underground facility information.

Use Cases

· Busan Metropolitan Corporation has implemented the digital transformation of underground facilities by placing water resources (water supply, sewage, rainwater) and additional facility (electricity, gas, telecommunications, etc.) construction data in 3D space at the Busan Eco Delta City National Pilot City district in 2022.

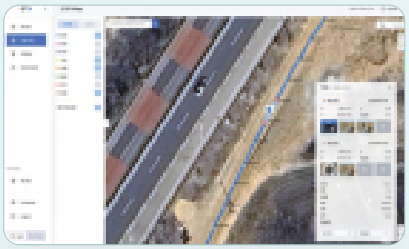
· Incheon Housing and City Development Corporation has built a management system for 7 underground facilities (water and sewage, electricity, gas, telecommunications, oil pipeline, and heating) by developing a GIS management app for underground installations in Geomdan New Town in 2022.

· The Ministry of Land, Infrastructure, and Transport is conducting a global cooperation program, the K-City Network Project, to test possible solutions for underground facility maintenance using smart city technology (as of 2024) in Hue, Vietnam.

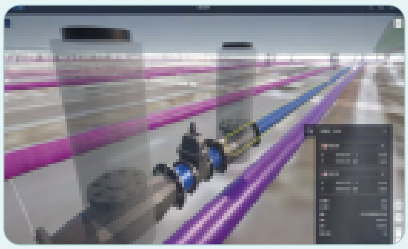
Key Components

Configuration

2D and 3D Facility Representation



Using collected location and image data from the field, 2D maps and 3D digital data are created to construct 3D construction models. These models ensure precise data are available during construction and are used for management and maintenance after completion.



Smart Pins for Facility Maintenance (Marking)

Using image and location data collected from the site, 2D maps and 3D digital data are constructed. A 3D construction model is provided to secure accurate construction data, which is used for post-construction operations and maintenance.

Key Technologies

1. Building 3D Models Reflecting Design Drawings and Field Data

· Enhances design data by integrating construction data, automatically generating 3D models, and converting them into digital data.

POINT GIS-based Digital Twin visualization (e.g., underground water pipelines, construction records).

2. Real-Time Field Data Integration with Facility-Based Digital Twins

· Uses precision GPS information to connect underground facilities, collects location data and attributes in real-time, and provides GIS-based 2D and 3D data.

POINT Helps integrate design data with field usage through facility monitoring, improving resource management and operation accuracy.

3. Pre- and Post-Construction Maintenance with Data Integration

· Manages design and maintenance data using dashboards and XR technology, ensuring efficient field maintenance after construction.

Korea Water Resources Corporation: Reservoir Safety Monitoring

· A case of using Digital Twin technology to perform cooperative tasks between the smart city-related center at Busan Eco Delta City and field sites.

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