

3D Construction Management System for Underground Geo-spatial Information

3D construction management system for underground geo-spatial information is a construction management technology that improves design, construction, and maintenance efficiency by building a GPS-based, three-dimensional model of underground facility construction information such as power and gas pipes.

The 3D construction management system for underground geo-spatial information integrates and manages data required for underground facility design, construction, and maintenance to improve constructability and construction quality, and also contributes to improving maintenance efficiency and preventing safety accidents during further construction.



▲ A facility manager views augmented reality-based 3D underground utility locations and attributes.

Issues to Tackle

- ☑ After construction, measurement data for underground facilities is submitted to the managing authority, creating a management gap.
- ☑ Due to difficulties in verifying information about underground facilities such as electricity, telecommunications, and gas pipes, there remains a constant risk of damage when constructing additional facilities.

Expected Benefits

- ☑ Verifying design interference through virtual pre-construction and performing precise excavation before burying utilities like electricity, telecommunications, and gas pipes, reducing construction time.
- ☑ Preventing safety accidents through accurate on-site maintenance of underground facilities based on high-precision GPS location information and augmented reality.

💡 Key Services

- Generating 3D construction information models by combining underground facility design drawings with attribute values of underground facilities surveyed using high-precision GPS.
- Integrating monitoring of actual survey-based design, construction, and maintenance data through a web-based dashboard.
- Verifying augmented reality-based 3D underground facility information by authorized work managers and facility managers by recognizing smartphone apps on facility markers (smart pins) at the bottom of facilities.

⚙️ Use Cases

- Busan Urban 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 Urban 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.
- Through the K-City Network Project, a global cooperation program supported by the Ministry of Land, Infrastructure, and Transport, a demonstration of underground facility maintenance solutions using multi-purpose integrated underground facility markers (Smart Pins) will be conducted in Hue City, Vietnam, in 2024.

Key Components

Configuration

2D, 3D facility expression

By using image data collected from the site, 2D maps and 3D digital data are constructed, providing a 3D construction model. This helps to secure standardized construction data and enables the use of data for post-construction and maintenance purposes.



Smart pin (Indicator) for facility maintenance

Encrypted on-site facility information stored
 ※ Inserting a minimum of 1 to 4 chips depending on the facility size in the area.



Technology

1. 3D establishment reflecting design drawings and on-site information

- Processing construction drawing data to automatically generate 3D modeling and convert design data into digital format.

2. Managing construction in real-time based on data reflecting the current site conditions

- Utilizing high-precision GPS to collect accurate location information of underground facility connections, collecting/building construction attribute data.

3. Web-based data visualization and post-construction remote maintenance using XR

- Providing construction data and maintenance history, utilizing dashboards and XR technology for maintenance and site monitoring.



Korea Water Resources Corporation Water Treatment Plant Safety Monitoring

· A case where the Busan Eco Delta Smart City Control Center and on-site personnel collaborated based on digital twin technology.



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