Implementation of a Digital Twin for the Management and Monitoring of Transmission Facilities in Mountainous Areas

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ABSTRACT

Transmission facilities are security and resource infrastructure that must be managed at a national level, making periodic monitoring and management crucial. However, due to the size and location of these facilities, monitoring and management can be challenging. This is especially true in mountainous areas, where access is difficult and there are many changing objects such as trees. To address this issue, this study developed a digital twin software that facilitates the management of transmission facilities using satellite imagery for periodic monitoring and spatial information. This technology consists of two main components: digital twins and monitoring. The digital twin, the fundamental element of this technology, constructs a 3D space based on open data such as Cesium and Google 3D maps, and models objects within this space based on transmission facilities and forest cover. For monitoring, the software enables time-series observation of images from satellites such as CAS500-1, KOMPSAT-3/3A, and WorldView-3. It also features functionalities for the automatic/manual collection of spatial information to display on the digital twin. Furthermore, to enhance monitoring capabilities, functions for site selection of transmission facilities and path calculation for management have been developed. This digital twin software is expected to establish a foundation for remote management of transmission facilities located in hard-to-access areas, such as mountainous regions.

Keywords: digital twin, satellite image, geoinformation, monitoring