

# The Intelligent Transformation of Surveying and Mapping: An Institutional Review of Innovative Solutions

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## SUMMARY

In recent years, the surveying and mapping industry has been undergoing a profound transformation. Having evolved through analog, digital, and information-centric paradigms, the field is now rapidly advancing towards an era of intelligent surveying, driven by the interdisciplinary fusion with new-generation information technologies. Despite this irreversible trend, significant application bottlenecks remain, such as the limited generalization and robustness of intelligent models across diverse and complex scenarios, the fragmentation of task workflows, which hinders end-to-end, integrated processing, and the gap between automated outputs and the trustworthiness and reliability required for high-stakes applications. How to achieve geospatial solutions that are highly intelligent, responsive to on-demand needs, and built on ubiquitous fusion has become the key technical challenge for this intelligent transformation. Therefore, this report presents recent advances from our institute toward geospatial solutions that are highly intelligent, on-demand, and built on ubiquitous fusion. Specifically: (1) foundational technology architectures, featuring an all-domain positioning framework for seamless indoor-outdoor navigation and an acoustic-based geodetic network for underwater control, alongside a spatio-temporal foundation model architecture designed to unify the intelligent analysis of diverse remote sensing and geospatial data; (2) innovative software systems, such as a space-air-ground collaborative platform for geological hazard monitoring and AI-guided, human-in-the-loop software for reliable information extraction from remote sensing imagery; and (3) integrated hardware equipment, including lightweight mobile mapping systems and UAV-based single-point bathymetry systems. These technologies have received national and international recognition and are deployed in mission-critical scenarios, advancing all-domain perception, cross-scenario adaptation, and the overall level of geospatial intelligence.

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