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Tools and Technology in Support of Integrated Applications (1)

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USE OF INTEGRATED SPACE AND TERRESTRIAL TECHNOLOGIES FOR LARGE
INFRASTRUCTURE MONITORING

Abstract

Under the Integrated Applications Promotion (IAP) initiative, GeoSHM was sponsored by ESA initially as a feasibility study (2013) and then a demonstration project (2016). It uses integrated GNSS and Earth Observation technologies with on-site sensor systems to monitor land movements, assess their impacts on the major structural components of a bridge and establish the interaction of loading and response to assess the structural health conditions of large bridges. GeoSHM has been running as a real-time monitoring system on the Forth Road Bridge in Scotland since 2014. At the same time GeoSHM has been used to trial the proposed data services on long bridges in China, a country that owns more than half of the world long-span bridges. In this paper the GeoSHM team will present their work from the past eight years that includes: the design of the overall system architecture; the use of cabled and wireless communications for secured data transmission from the monitoring sites on the bridge to the on-site data server and a remote processing server; the development of an innovative data strategy for pre-processing and establishment of one-to-one correspondence between loading forces and structural responses that is empowered with big data analytics; cloud computing; and deep learning. It will also demonstrate how GeoSHM was successfully used to address maintenance issues of the bridge under normal operations and during extreme loading events. As an ESA IAP project the GeoSHM team is very active in the development of feasible business models tailored for different geographical landscapes and the promotion of wider downstream applications into other areas such as regional key infrastructure monitoring such as highway road networks, dams, high-rise structures such as extra-high buildings and towers (>200m) and wind turbines. The GeoSHM team will also present their business engagement plans relating to the use of integrated space technologies in support of sustainable regional development.