

Exploring New Solutions for Large Areas or Long Linear Structures Monitoring: INSAR from Satellites and Lidar from UAV

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Key words: Deformation measurement; Engineering survey; Laser scanning; Photogrammetry; Remote sensing; Risk management; Lidar; Insar; satellites; UAV; drone; dikes; landslides; monitoring; subsidence; sinkholes

SUMMARY

The Synthetic Aperture Radar Interferometry (INSAR) uses multi-temporal image data acquired by SAR satellites as they fly over land on their polar orbit. It aims to estimate for each pixel of the radar images the phase difference between two acquisitions in order to quantify a variation of distance and therefore a displacement on natural (rocks, buildings ...) or artificial targets (reflective corners). INSAR is one of the techniques explored since 2009 by EDF to improve and optimize the supervision of its infrastructures. Thanks to collaboration with the French research laboratory GIPSA-Lab of Grenoble INP and through studies carried out with the leading companies in the field, the limits of use and the level of uncertainty are better understood today.

From a lower but still aerial point of view, Lidar embedded in UAV may offer interesting monitoring system to cover long linear of structures such as dikes. For now, the survey monitoring of such structures is carried out by classic methods, most often by direct levelling. These methods do not allow detection of local subsidence such as sinkhole which would appear between two levelling points. These are usually detected by the regular visual inspection. On limited sections of a few hundred meters, static Lidar (Laser scanning) can possibly be used to ensure an exhaustive coverage of the whole surface of the structure. But this quickly becomes very heavy to implement on longer distances, reason why, experiments and developments are carried out at EDF to evaluate monitoring survey using Lidar embedded on fixed wing UAV to cover long linear in full autonomy. Developments concern, on one hand, the carrier and the embedded sensors and, on the other hand, the post-processing tools adapted to the detection of these localized defects without introducing too many constraints for global geo-referencing. The final objective is to get a simple and fast UAV system that can easily be operated to support inspection and monitoring works and help for early detection of

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anomalies.

This paper proposes to present various experimentation results given by these two complementary technologies – Satellites INSAR and LIDAR UAV – at EDF in the framework of infrastructures monitoring.

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