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Assessment, Upgrading and Refurbishment of Infrastructures - Abstract Submission

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Title: A Radar-based Remote Sensing Solution for Infrastructure Monitoring

In this paper, we report on experiments with a new remote sensing method for infrastructures that is based on radar-technology. The MetaSensing ground-based radar allows non-intrusive measuring of the dynamic behaviour and long-term deformation of structures at both a high spatial and temporal resolution. The sensor is portable and built on innovative technologies, where monitoring is performed remotely under all weather conditions. It can be used in two configurations: as *Real Aperture Radar* (RAR), capable of accurately measuring displacements along a linear range profile, ideal for monitoring vibrations of structures like bridges and towers. Modal parameters can be determined within half an hour. Alternatively, the FastGBSAR (*Fast Ground Based Synthetic Aperture Radar*) produces two-dimensional displacement images every 10 seconds, ideal for monitoring areal structures like dams and natural hazards.

The conducted experiments relate to the monitoring of a major Dutch highway bridge, the Hollandse Brug, subject of intensive monitoring since 2008, when it was drastically refurbished, after 40 years of service. The concrete bridge has a monitoring network of 145 sensors, including strain, vibration and temperature. To this collection, we now add an experimental radar facility, such that the dynamic behaviour of the bridge can be sensed simultaneously using the existing sensor network and through the new remote sensing method based on the MetaSensing radar technology. We compare the measurements obtained through the attached sensors to the non-intrusive method, and demonstrate the benefits and limitations of the new radar technology. The radar solution will be specifically relevant in situations of ad-hoc monitoring, where the installation of a full-blown sensor network is too costly, or for structures where access to the components of interest is hard to achieve, for example on bridges.