

Separating long term bridge deformations from traffic or temperature induced deformations

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SUMMARY

Structural Health Monitoring (SHM) aims to detect damages of civil structures and assess their structural integrity. Contrary to natural structures like rock faces where conventional congruency-based deformations are sufficient, the processing of deformation of civil structures requires more advanced techniques. Bridges, water dams or buildings deform constantly due to changing impacting forces like traffic, wind or ambient temperature. The goal of SHM is therefore the separation of normal deformations from deformations caused by degradation of the structure's health.

In this article we investigate the long-term behavior of a large-scale highway bridge which has been equipped with a variety of sensors including Internet of Things (IoT) tilt sensors, Distributed Fiber Optic Sensing (DFOS) interrogators, Robotic Total Stations (RTS) and Terrestrial Laser Scanners (TLS). We highlight the challenge of detecting small long-term changes in the data as the amplitudes of normal deformations can be significantly higher than long term trends.