Abstract

A Monitoring Approach to Smart Infrastructure Management †

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Technical infrastructure forms a main pillar of the modern world, hosting our built environment, serving transportation and communication needs, as well as enabling the generation and transfer of energy. Within this context, engineers and owners need to warrant safe and robust operation of these systems for ensuring a smooth societal flow and resilience against short- (extreme events) and long-term threats (deterioration and fatigue processes). In tackling this challenge, engineers are becoming increasingly aware of the benefits stemming from Structural Health Monitoring, i.e., the process of gathering feedback from engineered systems via use of appropriate sensory systems. Developments in low-cost and easily deployed sensors allow for instrumentation of large scale structures, such as bridges, buildings, dams or wind turbines, generating a Big Data stream of diverse information, such as acting loads, strains, cracking and dynamic response.

When adequately interpreted through fusion with appropriate models, this data may then be transformed into effective knowledge on structural performance thereby facilitating the operation and maintenance of infrastructure. This talk will discuss methods and tools for tackling the multiplicity of challenges in this non-trivial task. Among others, we will discuss the monitoring, simulation and protection of systems that are of uncertain nature, either due to modeling imprecision or due to influence of continually varying and little known environments; the challenges of non-linearity and high-dimensionality; the extraction of salient features and robust performance indicators able to warn of damage and deterioration, as well as policy-planning for getting more out of engineered components, systems and networks.