

## **The role of Structural Health Monitoring in the infrastructure management of future cities**

Raimondo Betti

*Civil Engineering and Engineering Mechanics, Columbia University, New York, USA*

**Abstract:** In recent years, thanks to the advances in sensing and computing technologies, we have witnessed the beginning of a new era that will completely change the way we live our lives. Driverless cars and trucks will move people and goods with minimal travel time and energy consumption, reducing traffic congestion and the environmental footprint. Buildings will be able to optimize their performance based on the preferences of the occupants by actively reducing vibrations, by controlling the inside temperature and lighting, by changing their exposure to the sun, by optimizing elevator runs, etc. It will be possible to check the structural integrity of roads and bridges in real time and, when necessary, redirect the traffic flow and provide the appropriate maintenance operations.

It is in this framework that Structural Health Monitoring (SHM) finds a prominent role in the way the infrastructure of our future cities will be managed. Modern bridges are now built with hundreds of sensors that provide large amounts (terabytes) of data, e.g. accelerations, temperature, humidity, wind speed, etc., that need to be processed in real time to extract information about the structural conditions and, consequently, to decide the need for proper corrective actions. In the SHM arena, a shift is occurring from a model-based SHM, that might require a strong engineering knowledge but, at the same time, can provide high level of sophistication in terms of damage assessment, to a data-based SHM, where rapid assessment of the structural conditions can be performed without a detailed knowledge of the structure.

In this lecture, an introduction to the ideas and principles behind SHM and the latest development in the field will be presented.