

## **AUTOMATED VIBRATION BASED STRUCTURAL HEALTH MONITORING OF CIVIL ENGINEERING STRUCTURES**

**A. Deraemaeker**

*BATir – Université Libre de Bruxelles (ULB), 50 av F.D. Roosevelt, CP 194/02, 1050 Brussels,  
Belgium, [aderaema@ulb.ac.be](mailto:aderaema@ulb.ac.be), <http://batir.ulb.ac.be>*

**Keywords:** Vibration based structural health monitoring, damage detection, spatial filters

**Abstract.** With the current trend to put massive instrumentation on critical civil engineering infrastructure such as bridges, it has become possible to monitor permanently their dynamic response to ambient excitations without disrupting the traffic. Such dynamic responses can be used to detect deviations from the healthy condition caused by deteriorations to the structure. For the implementation of an efficient structural health monitoring system, it is essential to develop methods which are able to treat this huge amount of data in real time and provide a diagnostic. This paper will review the different steps needed to go from raw measured data to information in order to assess the state of health of the structure in real time. The approach presented relies on the use of spatial filters coupled to efficient signal processing and statistical tools [1-3]. After the initial design step, the system is able to function in a fully automated mode. The key aspects of the system which will be highlighted are efficient data reduction, intelligent feature extraction, and appropriate statistical analysis for decision making.

- [1] A. Deraemaeker. *Vibration based structural health monitoring using large sensor arrays: overview of instrumentation and feature extraction based on modal filters*. CISM Lecture Notes Vol 520. Springer, 2010
- [2] G. Tondreau and A. Deraemaeker. Local modal filters for automated data-based damage localization using ambient vibrations. *Mechanical Systems and Signal Processing*, 39(1-2):162–180, 2012.
- [3] A. Deraemaeker, E. Reynders, G. De Roeck, and J. Kullaa. Vibration-based structural health monitoring using output-only measurements under changing environment. *Mechanical Systems and Signal Processing*, 22:34–56, 2008.