

Innovative Monitoring through Operational Modal Analysis

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Abstract. Structural Health Monitoring (SHM) is nowadays common in many branches of engineering since it allows to have a continuous or periodic report of the structural conditions and therefore to intervene promptly if there are incipient damages. The first step to perform a SHM is the identification of the dynamic parameters, i.e. natural frequencies, damping ratios and modal shapes, and it is a crucial step since a modification of the structural parameters can be a direct consequence of structural damages. Among the structural identification methods, Operational Modal Analysis (OMA) methods have received increasing attention from the researchers since they do not require the knowledge of the structural excitation that is due to ambient vibrations and that is usually modeled as a white noise. This aspect makes this kind of methods cheaper and simpler than the classical Experimental Modal Analysis (EMA) methods.

In this seminar an innovative OMA method is proposed. It is a semi – automated method that allows to identify natural frequencies, damping ratios and modal shapes of a structural system and that can be used also from users that have not knowledge in stochastic dynamics and signal analysis. Specifically, first of all the modal shapes are estimated through the use of signal filtering techniques applied on the stochastic properties of the output process and then natural frequencies and damping ratios can be estimated from the mono – component analytical signals obtained by performing a decomposition of the analytical signals matrix. The proposed method has been used to perform the dynamic identification of a real historic building situated in Palermo, i.e. Chiaramonte palace, and the results obtained have been compared with those obtained by using other OMA methods.