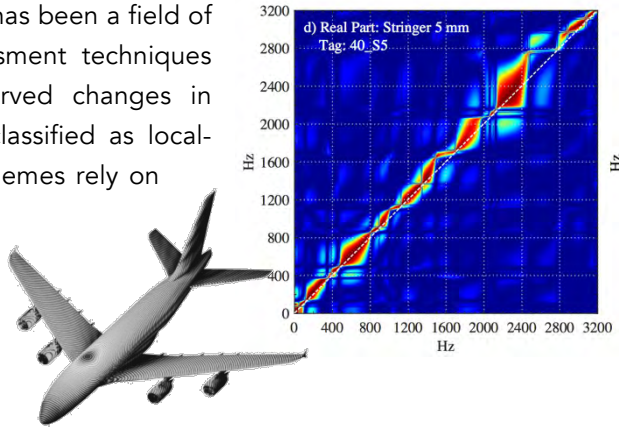
PERSONA CIÈNCIA EMPRESA
UNIVERSITAT RAMON LLULL
SCHOOL OF ENGINEERING

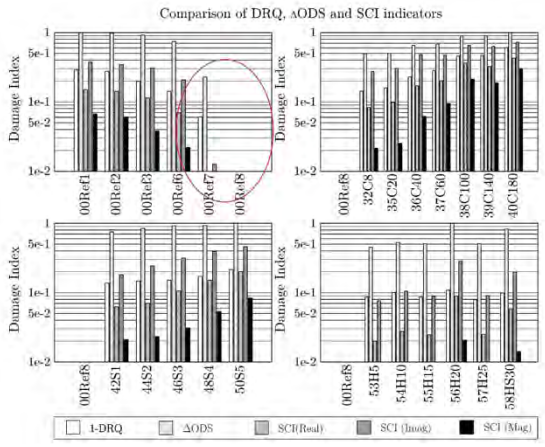
DYNAMICS AND VIBRATION LABORATORY
GROUP OF INDUSTRIAL ENGINEERING PRODUCTS (GEPI)
DEPARTMENT OF INDUSTRIAL ENGINEERING

NEW DEVELOPMENTS ON VIBRATION BASED APPROACHES FOR DAMAGE IDENTIFICATION AND ASSESSMENT OF SMART STRUCTURES

The development of structural health monitoring systems (SHMS) has been a field of increasing research activity in recent decades. Structural assessment techniques address the problem of damage identification through observed changes in measured or estimated parameters. These techniques can be classified as local-damage and global-damage detection methods. Most global schemes rely on measured changes in spatiotemporal vibrational response induced in the structure. The principle underlying these methods is that a vibration response depends on the physical properties of a structure thus, once damage emerge this may lead to detectable variations in the vibration response, which can serve as an indicator of early damage occurrence for structural assessment.



Vibration-based NDT methods can be classified into three main categories based on the parameter comparison: the modal domain using the modal parameters; the spatial model domain based on the mass, stiffness and damping matrices; and the response domain encompassing the time domain and the frequency domain which makes use of the frequency response functions (FRFs), the ODS or the derived transmissibilities. Our recent research demonstrated that spectral domain approaches present clear advantages such as convenient condensing procedures without loss of information through the Fourier transform, added post-process simplicity and enhanced sensitivity to degradation.



The objective of this project is to investigate the feasibility of using a spectrum vibration-based method for detection and quantification of linear and nonlinear damage on advanced structures, by using a spectral correlation approach and artificial neural networks. It involves an experimental research and numerical simulations. The Dynamic and Vibration Laboratory have a state-of-the-art equipment for testing materials over a wide range of loading conditions. It includes complete setup for Modal testing, multisensory Data acquisition systems, 3D Digital Image Correlation equipment and FDM professional printer.

We are looking for a highly-motivated student of Mechanical or Aerospace Engineering, or related science, for laboratory work in vibration analysis. Effective communication skills are required, and expertise in MATLAB is strongly preferred. Depending on the time commitment, authorship opportunities may be available for subsequent publications (e.g., posters, conferences, journal papers).

Positions offered (2017-2018): 2 Master research project (6-9 month)

Contact: Marco A. Pérez, PhD marcoantonio.perez@iqs.edu