Symposium on the Mechanics of Slender Structures (MoSS2015). 21 - 22 September 2015, Northampton, UK,

A TOUR OF NONLINEAR ANALYSIS OF ELASTIC STRUCTURES

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Abstract:

This lecture reviews recent developments of different areas working on the problems related to elastic structures(*related to theoretical, computational and experimental aspects of the problems*)such as plates,shells,beams,cables and so on, by looking at the manifestation and physical sources of nonlinear behavior. On the actual demand of the modern technology, in the modeling of such structures, it is unavoidable to take into account nonlinearities of the basic equations. New phenomena in Dynamics as well as new approaches to older ones are expected to be discovered in the theoretical, numeric and experimental investigations of those structures. Topics of interest include, but are not limited to local and/or global bifurcations, dynamic instability, energy transfer, dynamical integrity profiles, chaos, and control of chaos, singular perturbations and asymptotic methods and reduced order modeling.

On the other hand, in recent years, a large amount of research has been dedicated to new materials and their use in new structural components. Among new materials, functionally graded materials and other composites, shape memory alloys, magneto rheological materials, dielectric elastomers, polymers and thin-films have shown great potential for applications in all engineering fields.So, research has been conducted in applications of these materials from Micro and Nano structures to Large Space Structures. These structures are usually rather slender leading to an eminently non-linear behavior, including new types of nonlinearities and forces.

In particular, we will discuss several types of oscillations, arising from the interactions of the vibrating systems, with the energy source (small motors, electro-mechanical shakers, and so on)

Key words:

Physical and sources of nonlinear behavior. Nonlinearity of a structural elastic system. Examples of nonlinearities in practical engineering applications. Vibrating Systems with limited power supply