NONLINEAR DYNAMICS IN MEMS: A MODEL ORDER REDUCTION TECHNIQUE BASED ON THE IMPLICIT STATIC CONDENSATION

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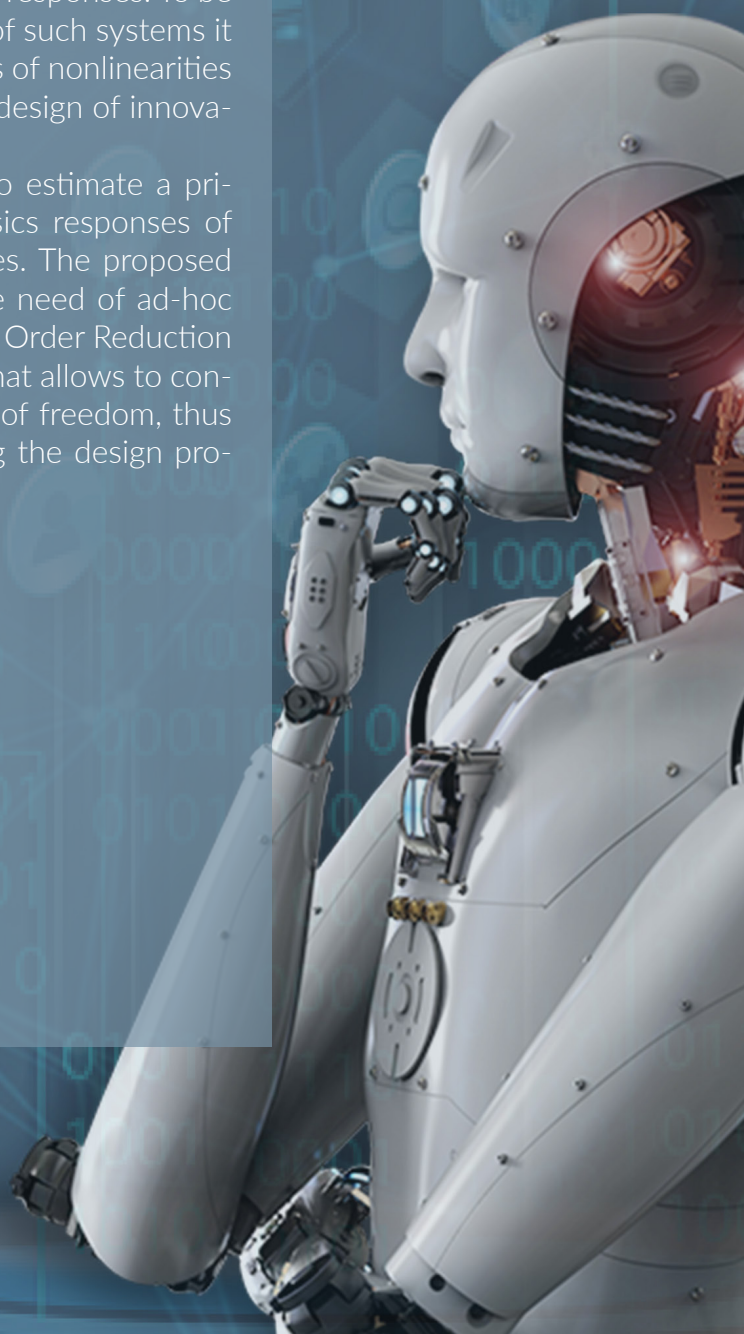
Abstract

Micro-Electro-Mechanical Systems (MEMS) revolutionized the consumer market for their small dimensions, high performances and low costs. In recent years, the evolution of the Internet of Things is posing new challenges to MEMS designers that have to deal with complex multiphysics systems experiencing highly nonlinear dynamic responses. To be able to simulate a priori and in real-time the behavior of such systems it is thus becoming mandatory to understand the sources of nonlinearities and avoid them when harmful or exploit them for the design of innovative devices.

In this seminar, I will present a numerical tool able to estimate a priori and in real-time the complex nonlinear multiphysics responses of MEMS devices without resorting to simplified theories. The proposed tool predicts different working conditions without the need of ad-hoc calibration procedures. It consists in a nonlinear Model Order Reduction Technique based on the Implicit Static Condensation that allows to condense the high fidelity FEM models into few degrees of freedom, thus greatly speeding-up the solution phase and improving the design process of MEMS devices.



Presentation time

10.00 - 10.15