

Nonlinear Dynamics: from theoretical tools to applications

Claude Henri Lamarque

DySCo Team

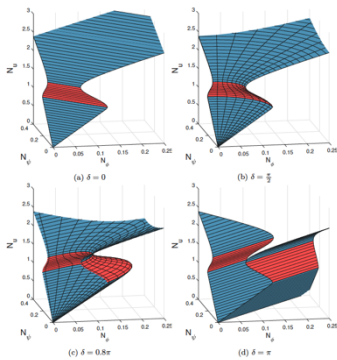
University of Lyon, ENTPE, LTDS UMR 5513 CNRS France

e-mail: Claude.Lamarque@entpe.fr

This talk will be split into two parts.

First, I recall a few mathematical results for nonlinear dynamical systems (smooth or nonsmooth). The idea is to show that various mathematical tools could be useful to improve understanding of applied nonlinear dynamics. For nonsmooth systems, I will recall how numerical methods could be built from models involving maximal monotone operators in deterministic or stochastic frame without or with delay. I will also give a few examples of physical systems that could be treated by this approach or NLCP approach.

For smooth systems, I will give a few examples to discuss advantages and limitations of algebraic tools (Groebner basis) used to obtain periodic solutions (in the frame of normal form theory or in the frame of analytical method applied to polynomial nonlinear dynamical systems to solve the problem of multiplicity of nonlinear periodic solutions).



In the second part, I will recall the main ideas to develop nonlinear passive absorbers of Nonlinear Energy Sinks type and I will describe some results and applications of NESs. I will recall briefly how to design NESs and I will describe development of nonlinear passive control for different systems. For example:

- a cable with horizontal or vertical oscillations,
- oscillations of a pendulum (cable car) attached to its cable
- a nonlinear absorber to control essential tremor.

Bio-sketch of C. H. Lamarque



Claude Henri Lamarque received his Ph.D. in Mechanics at Ecole Centrale de Lyon in 1992 and Habilitation at Univ. Lyon in 1998. He received Engineer diploma from ENTPE and M.Sc. in Applied Mathematics from Univ. St-Etienne in 1985.

He has been Head of Geo-Materials Laboratory (2002-2008) and Head of Building and Civil Engineering Department at ENTPE (2009-2012), Head of ENTPE's site of LTDS UMR 5513 CNRS (2012-2022), Head of GDR CNRS 3437 DYNOLIN (national research group in nonlinear dynamics of structures, 2011-2018). He is member of EUROMECH and ENOC Committee. He is currently Prof. at ENTPE (Univ. Lyon).

His research is focused on nonlinear dynamical systems (smooth or nonsmooth), nonlinear vibrations and acoustics, applications to passive control of oscillations, reduced-order modeling, NEMS/MEMS, dynamics of cables, adaptive metamaterials. He has published over 180 archival publications, 2 patents, and 3 monographs.