

Abstracts SAMI 2010

Non-smooth systems and control strategies: several examples in engineering

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In the lectures we will analyze the dynamical properties of a class of non-smooth systems simulators. A non-smooth system is a dynamical system with a state that can both flow and/or jump. Its simulator attempts to generate its solutions approximately. The lectures will show mild regularity conditions on the non-smooth system and its simulator to guarantee that simulated solutions are close to actual solutions, and that asymptotically stable compact sets are preserved, in a semiglobal practical sense, under simulation. In fact, it will be established that asymptotically stable compact sets are continuous in the integration step size parameter of the simulator; that is, as the step size of the simulator converges to zero, the asymptotically stable set observed in simulations approaches the asymptotically stable compact set of the true hybrid system. Examples in engineering and control will be used to illustrate concepts and results.

Bifurcations of non-smooth systems

Dr. Gerard Olivar

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Non-smooth systems are at the core of many application-oriented problems in science and engineering. They include examples in sustainability, electronics, mechanics, chemistry, communications and biology, among others. In these lectures, several important classes of non-smooth systems will be presented. Namely, impact systems, Filippov systems and piecewise-smooth continuous

systems will be shown. Focus will be given to Filippov systems, which display a wide range of phenomena. Sliding trajectories are unique to these systems. Bifurcations of Filippov systems in planar systems will be studied with more detail, although several key examples of each three subclasses will be shown. These lectures will be much connected to the other two speaker lectures, thus providing a complete and intensive introduction to non-smooth systems.

Bifurcations in piecewise linear systems: case studies

Dr. Enrique Ponce

Universidad de Sevilla

The work carried out by the research team in Seville regarding non-smooth systems and its applications in several areas is very remarkable and well-known in the literature. Many theoretical useful papers have been published in top-rank journals. The lectures will be based on bifurcations of a subclass of non-smooth systems, the so-called piecewise-linear systems. Many case studies will be shown including electronic, mechanical and other engineering and science oriented examples. Theory and applications will be supported by numerical simulations which will reinforce the lectures given by one of the other speakers, Dr. Enric Fossas. Thus a very good cross-fertilization between both speakers will be accomplished.