

Piecewise linear system dynamics

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Resumen

In this talk we will deal with autonomous and piecewise linear continuous vector fields whose state space is splitted in two or three zones by means of hyperplanes, in such a way that the vector field defines a linear system inside each zone. Our first objective is to illustrate how the study of these systems is interesting by itself, and not only because they are very common mathematical models in applications, since they possess the capability of showing much of the dynamical complexity richness to be expected in nonlinear dynamics. For these reasons, they play a relevant role in the recent history of dynamical systems in general.

A second part of the talk will be devoted to show that piecewise linear systems are ideal as pedagogical examples to understand nonlinear dynamical behavior with relatively simple arguments (e.g. the existence of isolated periodic oscillations or limit cycles).

To finish the presentation, we will highlight some characteristic properties of piecewise linear systems in the framework of control theory regarding concepts as feedback, controllability and observability. These characteristics provide an interesting insight related in some sense with the internal structure of the system.