Piecewise linear version of Michelson system: periodic behavior and noose bifurcation.

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Abstract

In a previous talk by F. Fernández-Sánchez, a piecewise linear version of Michelson system [5],

$$\dot{x} = y, \quad \dot{y} = z, \quad \dot{z} = 1 - y - \lambda\left(1 + \lambda^2\right)|x|, \text{ with } \lambda > 0, \tag{1}$$

was presented, together with the analysis of some of its global bifurcations.

Following with the idea of reproducing by piecewise linear continuous systems the behavior previously observed in smooth systems, we focus our attention in a special one-parameter family of reversible periodic orbits that was numerically obtained in the original Michelson system and it is organized in a particular structure called "noose bifurcation" [4]. In this family, the orbit that appears from a period doubling bifurcation collapses with the original limit cycle by means of a fold bifurcation of periodic orbits. For system (1), this noose structure involves two kinds of periodic orbits (in terms of the number of intersections with the separation plane $x = 0$): those that intersects twice (RP2-orbits) or four times (RP4-orbits) the separation plane.

In this talk, some results about the periodic orbits corresponding with the noose bifurcation will be presented ([1, 2, 3]). In particular, we give a global result of existence for RP2-orbits and a local result about RP4-orbits. Moreover, we detect new period doubling and symmetry breaking bifurcations, describe the family of periodic orbits that appear from them and study how they are related with global connections.

Referencias

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