Symmetries Impact in Chaotification of Piecewise Smooth Systems

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Abstract: This paper is devoted to a mathematical analysis of a route to chaos for bounded piecewise smooth systems of dimension three subjected to symmetric non-smooth bifurcations. This study is based on period doubling method applied to the associated Poincaré maps. These Poincaré maps are characterized taking into account the symmetry of the transient manifolds. The corresponding Poincaré sections are chosen to be transverse to these transient manifolds, this particular choice takes into account the fact that the system dynamics crosses the intersection of both manifolds. In this case, the dimension of the Poincaré map (defined as discrete map of dimension two) is reduced to dimension one in this particular neighborhood of transient points. This dimension reduction allows us to deal with the famous result "period three implies chaos". The approach is also highlighted by simulation results applied particularly to Chua circuit subjected to symmetric grazing bifurcations.

Keywords: *chaotification analysis; period doubling; non-smooth bifurcations; symmetries; Chua circuit.*

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