

## Nested closed invariant curves in the 2D piecewise linear normal form

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*Abstract:* In the present work we explain a possible mechanism leading to the appearance of several attracting closed invariant curves nested into each other in the piecewise-linear 2D normal form. We demonstrate that this kind of multistability may be related to the well-known period adding bifurcation structure. Recently, a similar phenomenon has been reported for a piecewise smooth map modeling the behavior of a power electronic DC-DC converter. In the reported case, two period adding structures overlap in the parameter space, causing two attracting closed invariant curves to coexist and their basins of attraction to be separated from each other by a repelling closed invariant curve. Now, we demonstrate that this type of multistability exists in a more general class of models and explain how it results from a specific deformation of a single period adding bifurcation structure. Here, the appearance of nested attracting closed invariant curves is caused by a combination of two effects: on one hand, the period adding structure is already deformed in such a way that the periodicity regions forming this structure overlap, and on the other hand, the closed invariant curves existing in some of these periodicity regions are still not destroyed. We also demonstrate that in this case the basins of attraction of the nested attracting invariant curves may be separated not only by repelling closed invariant curves, but also by chaotic saddles.

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