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On the upper bound of the criticality of potential systems at the outer boundary using the Roussarie-Ecalle compensator

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Abstract

This paper is concerned with the study of the criticality of families of planar centers. More precisely, we study sufficient conditions to bound the number of critical periodic orbits that bifurcate from the outer boundary of the period annulus of potential centers. In the recent years, the new approach of embedding the derivative of the period function into a collection of functions that form a Chebyshev system near the outer boundary has shown to be fruitful in this issue. In this work, we tackle with a remaining case that was not taken into account in the previous studies in which the Roussarie-Ecalle compensator plays an essential role. The theoretical results we develop are applied to study the bifurcation diagram of the period function of two different families of centers: the power-like family $\ddot{x} = x^q - x^p$, $p, q \in \mathbb{R}$ with $p > q$; and the family of dehomogenized Loud's centers.

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Keywords: Center; Period function; Critical periodic orbit; Bifurcation; Criticality; Chebyshev system

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