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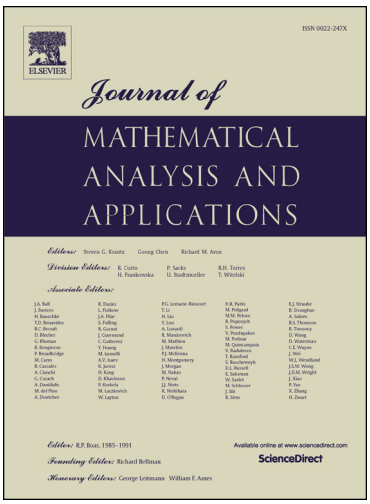

Bifurcation of limit cycles in a cubic-order planar system around a nilpotent critical point

Pei Yu, Feng Li

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Bifurcation of limit cycles in a cubic-order planar system around a nilpotent critical point

Pei Yu[a,1], Feng Li[b,1]

[a] *Department of Applied Mathematics, Western University, London, Ontario N6A 5B7, Canada*

[b] *School of Science, Linyi University, Linyi, Shandong 276005, P. R. China*

Abstract

In this paper, bifurcation of limit cycles is considered for planar cubic-order systems with an isolated nilpotent critical point. Normal form theory is applied to compute the generalized Lyapunov constants and to prove the existence of at least 9 small-amplitude limit cycles in the neighborhood of the nilpotent critical point. In addition, the method of double bifurcation of nilpotent focus is used to show that such systems can have 10 small-amplitude limit cycles near the nilpotent critical point. These are new lower bounds on the number of limit cycles in planar cubic-order systems near an isolated nilpotent critical point. Moreover, a set of center conditions are obtained for such cubic systems.

Keywords: Nilpotent singularity; generalized Lyapunov constant; the simplest normal form; limit cycle.

1. Introduction

Dynamical systems can exhibit self-sustained oscillations, called limit cycles, which may appear in almost all fields of science and engineering. Developing limit cycle theory is not only theoretically significant, but also practically important. Limit cycles theory is closely related to the well-known Hilbert's 16th problem, one of the 23 mathematical problems proposed by D. Hilbert in 1900 [25]. A modern version of this problem was included in

[1] Corresponding authors.
E-mail address: pyu@uwo.ca (P. Yu), lf0539@126.com (F. Li)